Series 1961, No. 9

Issued November 1964

SOIL SURVEY

Warren County Mississippi

OUR SOIL — OUR STRENGTH

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
MISSISSIPPI AGRICULTURAL EXPERIMENT STATION

HOW TO USE THE SOIL SURVEY REPORT

THIS SOIL SURVEY of Warren County will help farmers in planning the kind of management that will protect their soils and provide good yields; assist engineers in selecting sites for roads, buildings, and other structures; aid those interested in establishing or improving woodland; and add to our knowledge of soils.

Locating areas on the soil map

Use the index to map sheets to locate areas on the soil map. The index is a small map that shows what part of the county is represented on each sheet of the soil map. When the correct sheet is found, it will be seen that boundaries of the soils are outlined and that each soil is identified by a symbol. All areas marked with the same symbol are the same kind of soil. Suppose, for example, an area has the symbol MeA. The legend for the detailed map shows that this symbol identifies Memphis silt loam, 0 to 2 percent slopes. This soil and all the others mapped in the county are described in the section "Descriptions of the Soils."

Finding information

Farmers and those who work with farmers can learn about the soils in the section "Descriptions of the Soils" and can find suggestions for agricultural management of the soils in the subsection "Capability Groups of Soils." In this subsection the soils that need about the same kind of management are grouped by capability units. For example, Memphis silt loam, 0 to 2 percent slopes, is in capability unit I-1. The management this soil needs is given under the heading "Capability Unit I-1." From the subsection "Estimated Yields," farmers can find what yields can be expected from each kind of soil under a specified level of management. The "Guide to Mapping Units, Capability Units, and Woodland Suitability Groups," at the back of the report, shows where information about each particular use of the soils can be found in this report.

Foresters and others interested in woodland management can refer to the section "Woodland." In that section the soils of the county are grouped according to their suitability for trees, and factors affecting the management of woodland are explained.

Engineers can refer to the section "Engineering Uses of the Soils." Tables in that section show soil characteristics that affect engineering.

Scientists and others who are interested can find information about how the soils formed and how they are classified in the section "Genesis, Morphology, and Classification of Soils."

Students, teachers, and other users can find information about the soils and their management in various parts of the report, depending on their particular interest.

Newcomers in Warren County will be especially interested in the section "General Soil Map," which describes the broad patterns of soils. They may also wish to read the section "General Nature of the County," which describes the climate, physiography, relief, and drainage and gives some statistics on agriculture.

* * * * *

Fieldwork for this survey was completed in 1961. Unless otherwise indicated, all statements in the report refer to conditions at that time. The soil survey of Warren County was made as part of the technical assistance furnished by the Soil Conservation Service to the Warren County Soil Conservation District. Financial assistance was furnished by the Warren County Board of Supervisors.

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Series 1961, No. 9

Issued November 1964

SOIL SURVEY OF WARREN COUNTY, MISSISSIPPI

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UNITED STATES DEPARTMENT OF AGRICULTURE IN COOPERATION WITH THE MISSISSIPPI AGRICULTURAL EXPERIMENT STATION

WARREN COUNTY is in the west-central part of Mississippi (fig. 1). It is bordered on the west by the Mississippi River, except for a small part that lies west of the river and is bordered by Louisiana. It has an area of 382,240 acres.

Warren County is mainly agricultural. Cotton and timber products are the main cash crops. More than half of the county is not well suited to row crops, either because of steep topography or because of flood hazard; approximately 28 percent is steep and very steep; and 26 percent, mainly on the Mississippi River alluvial plain, is subject to flooding. This part of the county is in hardwood forest.

Several industries, including sawmills, cotton gins, and a cement plant, operate in the city of Vicksburg. There is also a shipping port on the Mississippi River.

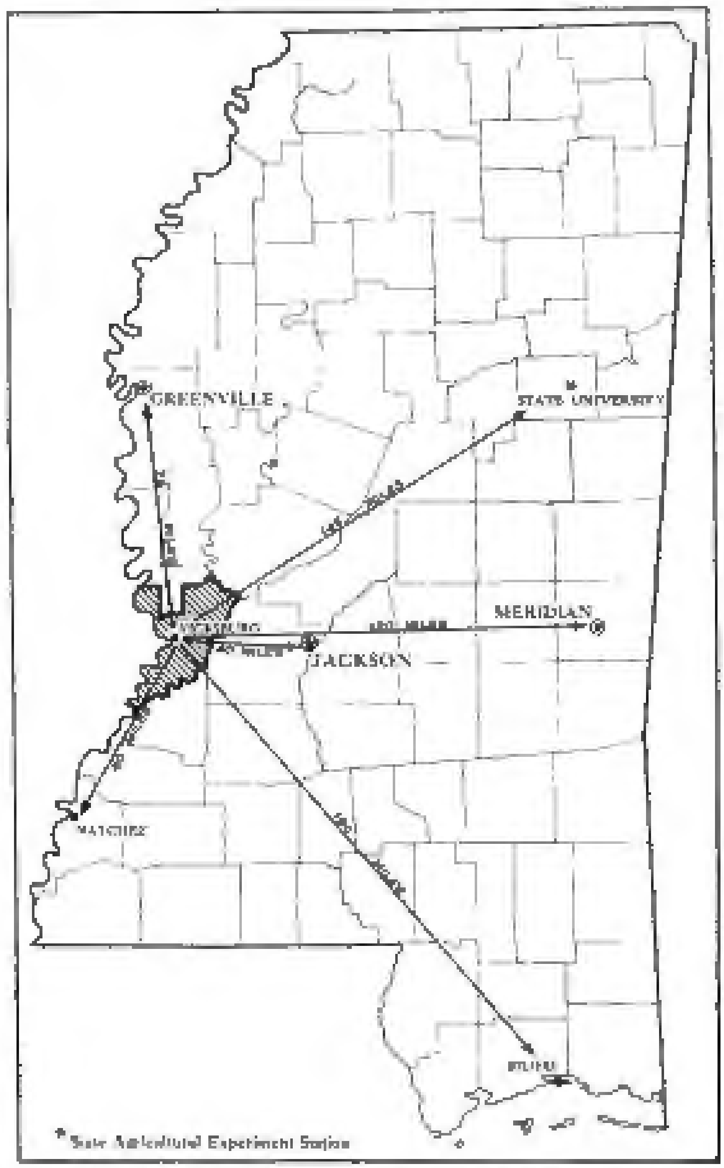

Figure 1.—Location of Warren County in Mississippi.

How Soils Are Mapped and Classified

Soil scientists made this survey to learn what kinds of soils are in Warren County, where they are located, and how they can be used. They went into the county knowing they likely would find many soils they had already seen, and perhaps some they had not. As they traveled over the county, they observed steepness, length, and shape of slopes; size and speed of streams; kinds of native plants or crops; kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by roots of plants.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. To use this report efficiently, it is necessary to know the kinds of groupings most used in a local soil classification.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important

characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Commerce and Memphis, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that go with their behavior in the natural, untouched landscape. Soils of one series can differ somewhat in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man.

Many soil series contain soils that differ in texture of their surface layer. According to such differences in texture, separations called soil types are made. Within a series, all the soils having a surface layer of the same texture belong to one soil type. Commerce silty clay loam and Commerce very fine sandy loam are two soil types in the Commerce series. The difference in texture of their surface layers is apparent from their names.

Some soil types vary so much in slope, degree of erosion, number and size of stones, or some other feature affecting their use, that practical suggestions about their management could not be made if they were shown on the soil map as one unit. Such soil types are divided into phases. The name of a soil phase indicates a feature that affects management. For example, Memphis silt loam, 2 to 5 percent slopes, is one of several phases of Memphis silt loam, a soil type that ranges from nearly level to steep.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that greatly help in drawing boundaries accurately. The soil map in the back of this report was prepared from the aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning management of farms and fields, a mapping unit is nearly equivalent to a soil type or a phase of a soil type. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil type or soil phase.

In preparing some detailed maps, the soil scientists show two or more soils as one mapping unit if the differences between the soils are not sufficient to justify separation for the purposes of the soil survey report. Such a mapping unit is called an undifferentiated group. Commerce, Robinsonville, and Crevasse soils is an example. Also, on most soil maps, areas are shown that are so rocky, so shallow, or so frequently worked by wind and water that they scarcely can be called soils. These areas are shown on a soil map like other mapping units, but they are given descriptive names, such as Gullied land or Swamp, and are called land types rather than soils.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soils in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soils. Yields under defined management are estimated for all the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in a way that it is readily useful to different groups of readers, among them farmers, ranchers, managers of woodland, engineers, and homeowners. Grouping soils that are similar in suitability for each specified use is the method of organization commonly used in the soil survey reports. Based on the yield and practice tables and other data, the soil scientists set up trial groups, and test them by further study and by consultation with farmers, agronomists, engineers, and others. Then, the scientists adjust the groups according to the results of their studies and consultations. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

After study of the soils in a locality and the way they are arranged, it is possible to make a general map that shows several main patterns of soils, called soil associations. Such a map is the colored general soil map in the back of this report. Each association, as a rule, contains a few major soils and several minor soils, in a pattern that is characteristic although not strictly uniform.

The soils within any one association are likely to differ in some or in many properties; for example, slope, depth, or natural drainage. Thus, the general soil map shows, not the kind of soil at any particular place, but patterns of soils, in each of which there are several different kinds of soils.

Each soil association is named for the major soil series in it, but, as already noted, soils of other series may also be present. The major soils of one soil association may also be present in another association but in a different pattern.

The general map showing patterns of soils is useful to people who want a general idea of the soils, who want to compare different parts of a county, or who want to know the possible location of good-sized areas suitable for a certain kind of farming or other land use.

1. Commerce-Robinsonville-Crevasse association

Somewhat poorly drained to excessively drained soils in medium-textured and coarse-textured recent alluvium

The Commerce-Robinsonville-Crevasse association occurs as broad, nearly level areas on recent natural levees in the western part of the county. It is mostly along the eastern side of the Mississippi River but includes also that part of the county that lies west of the river. The soils consist of medium-textured to coarse-textured recent alluvium. The coarser textured and better drained soils are commonly at the higher elevations, adjacent to the streams. Farther away from the streams, the soils are finer textured and more poorly drained.

This association makes up about 20 percent of Warren County. The Commerce soils make up 65 percent of the association; the Robinsonville soils, 13 percent; and the Crevasse soils, 8 percent. Bowdre, Dowling, and Tunica soils make up the balance.

Commerce soils generally are at the lowest elevations on the levees. They are somewhat poorly drained to mod-

erately well drained. They have a surface layer of dark grayish-brown silt loam to fine sandy loam and a grayish-brown, stratified subsoil in which mottling begins about 22 inches below the surface.

Robinsonville soils generally are at the higher elevations, adjacent to the streams. They are moderately well drained to well drained and have a surface layer of very dark grayish-brown loam and a subsoil of dark grayish-brown fine sandy loam.

Crevasse soils occur on low ridges near old channel breaks. They formed in coarse-textured sediments and are excessively drained. The surface layer generally is dark brown, and the subsoil is pale brown.

More than two-thirds of this association is subject to frequent overflow and is in capability subclass Vw. The rest of the acreage consists of some of the best agricultural soils in the county. Most of this acreage of good soils is in class I and subclass IIw. It has been cleared and is used for cotton, corn, soybeans, and small grain, and for pasture. Natural fertility is high, and good tilth is easily maintained.

About 65 percent of this association is in forest. The chief commercial trees are eastern cottonwood, hackberry, pecan, and American sycamore.

The farms are mostly of the general type. They range from small, owner-operated units to large plantations.

2. *Sharkey-Tunica-Dowling association*

Poorly drained and somewhat poorly drained soils in fine-textured slack-water alluvium

The Sharkey-Tunica-Dowling association occupies wide, level and nearly level, slack-water areas, within which are scattered sloping areas along narrow depressions. The soils consist of clay sediments deposited by still or slowly moving water.

This association makes up about 20 percent of Warren County. The Sharkey soils make up about 50 percent of the association; the Tunica soils, 20 percent; and the Dowling soils, 15 percent. Alligator and Bowdre soils and Swamp make up the balance.

Sharkey soils are on broad, low flats. They are poorly drained and have a surface layer of dark-gray clay and a subsoil of dark-gray clay mottled with brown.

Tunica soils are at the slightly higher elevations. They are somewhat poorly drained. The surface layer is very dark grayish-brown silty clay. The upper part of the subsoil is dark-gray clay mottled with brown. It is underlain by coarser textured material about 24 inches below the surface.

Dowling soils are in depressions. They are poorly drained and have a surface layer of dark-gray clay and a subsoil of dark grayish-brown clay mottled with brown and gray.

More than three-fourths of this association is subject to frequent overflow or backwater and is in capability subclass Vw. The rest is in capability subclass IIIw.

About 85 percent of the association is in forest. The chief commercial trees are green ash, baldcypress, eastern cottonwood, sweetgum, water tupelo, and oaks of various species. The rest of the acreage has been cleared and is used principally for soybeans, cotton, and small grain. A considerable acreage is used as pasture. Natural fertility is high, but poor physical properties and poor drainage make these soils very difficult to manage.

The farms range from small family units to large plantations.

3. *Memphis-Natchez-Adler association*

Well drained and moderately well drained soils of hilly loessal uplands and local silty alluvium

The Memphis-Natchez-Adler association occurs as long, narrow ridges dissected by steep-walled drainageways, on the hilly to steep uplands. Most of the level and gently sloping areas are on flood plains and on narrow strips of uplands adjacent to the flood plains. The soils consist of loess.

This association makes up about 60 percent of the county. About 70 percent of the acreage consists of the Memphis and Natchez soils, and about 20 percent of the Adler soils. Falaya, Waverly, Wakeland, Grenada, Calloway, and Henry soils make up the balance.

Memphis soils are on the nearly level to steep ridges. In the steeper areas they generally are on the narrow ridgetops and the upper part of the slopes, and the Natchez soils are on the middle and lower parts. These soils have a surface layer of dark-brown or dark grayish-brown silt loam. The subsoil of the Memphis soils is dark-brown silty clay loam, and that of the Natchez soils is dark-brown silt loam. Areas of Gullied land are common in the steeper areas.

On the small flood plains are the Adler soils. They have a surface layer of brown silt loam and a subsoil of brown to dark-brown silt loam.

About two-thirds of this association is too steep to be cultivated safely. It is highly susceptible to erosion and is in capability subclasses VIe and VIIe. The nearly level to moderately sloping areas, which are suitable for cultivation, are in classes I to IV. They are mainly on the lower parts of hills and along drainageways. Most of the acreage that has been cleared is used for cotton, corn, soybeans, and small grain, but a large acreage is used as pasture. The soils respond well to management and are fairly easy to keep in good tilth. Natural fertility is moderately high. The reaction ranges from strongly acid to moderately alkaline.

About 75 percent of this association is in forest. The chief commercial trees are white ash, green ash, black cherry, cucumbertree, southern magnolia, sweetgum, yellow-poplar, shortleaf pine, loblolly pine, and oaks of various species.

The farms range from small family units to large plantations. Livestock farming is the main enterprise.

Descriptions of the Soils

This section describes, in nontechnical language, the soil series (groups of soils) and mapping units (single soils) of Warren County. The acreage and proportionate extent of each mapping unit are given in table 1.

The procedure in this section is first to describe the soil series, and then the mapping units in that series. Thus, to get full information on any one mapping unit, it is necessary to read the description of that unit and also the description of the soil series to which it belongs. As mentioned in the section "How Soils Are Mapped and Classified," not all mapping units are members of a soil series.

Gullied land and Swamp are miscellaneous land types and do not belong to a soil series but, nevertheless, are listed in alphabetic order along with the soil series.

Following the name of each mapping unit, there is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit are the capability unit and the woodland suitability group in which the mapping unit has been placed. The page on which each capability unit and woodland group is described can be found readily by referring to the "Guide to Mapping Units, Capability Units, and Woodland Suitability Groups" at the back of the report.

Soil scientists, engineers, students, and others who want detailed descriptions of soil series should turn to the section "Genesis, Morphology, and Classification of Soils." Many terms used in the soil descriptions and other sections of the report are defined in the Glossary.

Adler Series

The Adler series consists of nearly level, moderately well drained soils that formed in alluvium washed from the loessal uplands. These soils occur as small to fairly large areas in a band adjacent to the loessal bluff and in most of the stream valleys of the uplands. The natural vegetation was mostly hardwoods. The common trees were oak, cottonwood, sweetgum, sycamore, and yellow-poplar. The understory consisted chiefly of roughleaf dogwood, American holly, low shrubs, and vines.

The surface layer is brown silt loam, and the subsoil is brown to dark-brown silt loam. Natural fertility is moderate to high, the organic-matter content is low, and the reaction is mildly alkaline.

These soils are associated with the Wakeland, Collins, and Falaya soils. They are better drained than the Wakeland and Falaya soils. They are less acid than the Collins soils but have similar drainage.

The Adler soils are well suited to a wide range of crops and pasture plants. Most of the acreage is now in cultivated crops or in pasture.

Adler silt loam (Ad).—This is a moderately well drained, friable, mildly alkaline soil that is subject to overflow. Major horizons in profile:

0 to 8 inches, brown, friable silt loam.
8 to 26 inches, brown to dark-brown, friable silt loam.
26 to 42 inches, mottled grayish-brown, brown, and yellowish-brown silt loam.

The color of the surface layer ranges from grayish brown to brown, and that of the subsurface layer, from brown to dark brown. The depth to mottling ranges from 18 to 30 inches.

Small areas of Wakeland silt loam and Morganfield silt loam are included in the areas mapped.

Adler silt loam is moderate to high in natural fertility, is low in organic-matter content, and ranges from slightly acid to mildly alkaline. It has a thick root zone. The surface layer is fairly easy to keep in good tilth but tends to crust. Movement of water into and through this soil is moderate, and the available moisture capacity is high.

This is one of the most productive soils in the county. It is well suited to a wide range of plants. It is subject to frequent overflow of short duration. Streambank caving and overfalls are common problems. Most of the

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Acres	Percent
Adler silt loam	22, 030	6. 1
Adler and Morganfield silt loams, local alluvium	2, 490	. 7
Alligator clay	2, 410	. 7
Bowdre silty clay	775	. 2
Calloway silt loam	960	. 3
Collins silt loam	830	. 2
Collins silt loam, local alluvium	700	. 2
Commerce silt loam	3, 135	. 9
Commerce silty clay loam	8, 490	2. 3
Commerce very fine sandy loam	11, 925	3. 3
Commerce, Robinsonville, and Crevasse soils	43, 080	11. 9
Crevasse fine sandy loam	1, 315	. 4
Dowling clay	7, 345	2. 0
Falaya silt loam	11, 340	3. 1
Falaya silt loam, local alluvium	2, 970	. 8
Grenada silt loam, 0 to 2 percent slopes	615	. 2
Grenada silt loam, 2 to 5 percent slopes	395	. 1
Grenada silt loam, 2 to 5 percent slopes, eroded	425	. 1
Grenada silt loam, 5 to 8 percent slopes, severely eroded	215	. 1
Gullied land	24, 095	6. 7
Henry silt loam	400	. 1
Memphis silt loam, 0 to 2 percent slopes	2, 790	. 8
Memphis silt loam, 2 to 5 percent slopes	1, 115	. 3
Memphis silt loam, 2 to 5 percent slopes, eroded	2, 260	. 6
Memphis silt loam, 2 to 5 percent slopes, severely eroded	930	. 3
Memphis silt loam, 5 to 8 percent slopes, eroded	700	. 2
Memphis silt loam, 5 to 8 percent slopes, severely eroded	7, 915	2. 2
Memphis and Loring silt loams, 0 to 2 percent slopes	320	0. 1
Memphis and Loring silt loams, 2 to 5 percent slopes	505	. 1
Memphis and Loring silt loams, 2 to 5 percent slopes, eroded	3, 690	1. 0
Memphis and Loring silt loams, 2 to 5 percent slopes, severely eroded	2, 605	. 7
Memphis and Loring silt loams, 5 to 8 percent slopes, eroded	1, 170	. 3
Memphis and Loring silt loams, 5 to 8 percent slopes, severely eroded	8, 140	2. 2
Memphis and Natchez silt loams, 8 to 12 percent slopes, severely eroded	4, 155	1. 1
Memphis and Natchez silt loams, 12 to 17 percent slopes, severely eroded	3, 475	1. 0
Memphis and Natchez silt loams, 17 to 40 percent slopes, eroded	95, 260	26. 3
Morganfield silt loam	180	. 1
Robinsonville loam	400	. 1
Sharkey clay	12, 810	3. 5
Sharkey, Tunica, and Dowling clays	41, 075	11. 3
Silty land, rolling	1, 500	. 4
Silty land, steep	2, 310	. 6
Swamp	890	. 2
Tunica silty clay	4, 610	1. 3
Wakeland silt loam	6, 705	1. 9
Wakeland silt loam, local alluvium	1, 680	. 5
Waverly and Falaya silt loams	9, 150	2. 5
Total	362, 240	100. 0

acreage is in cultivated crops or in pasture, but some of the small areas that are not easily reached are in hardwood forest. (Capability unit IIw–3; woodland suitability group 1.)

Adler and Morganfield silt loams, local alluvium (Am).—Because of their similarity and the mixed pattern of occurrence, it was impractical to map these soils separately. Both soils formed in local loessal alluvium. The Adler soil is moderately well drained, and the Morganfield soil is well drained. Both occur on foot slopes and along and at the head of small drainageways. Some areas consist entirely of Adler soils, and some of Morganfield soils, but most areas include some of both.

The major horizons of the Adler soils are like the ones described for Adler silt loam, except that the depth to mottling ranges from 24 to 30 inches. Major horizons in profile of Morganfield silt loam:

0 to 6 inches, brown silt loam.
6 to 40 inches, dark-brown to dark yellowish-brown silt loam or silt.
40 to 50 inches, brown to dark-brown silt loam.

The color of the surface layer ranges from dark grayish brown to dark brown. The texture of the entire profile ranges from silt loam to silt. Gray mottles occur below a depth of 30 inches in places.

These soils are moderately high or high in natural fertility, are low in organic-matter content, and range from slightly acid to mildly alkaline in reaction. They have a thick root zone and are easy to work but tend to crust when bare. Movement of water into and through these soils is moderate, and the available moisture capacity is high.

These soils are some of the most productive in the county, and they are well suited to a wide range of plants. Nearly all of the acreage is in cultivated crops or in pasture. (Capability unit IIw–3; woodland suitability group 1.)

Alligator Series

The Alligator series consists of nearly level to level, poorly drained, clayey soils in slack-water areas. These soils formed in fine-textured alluvium deposited by the Mississippi River and its tributaries. They occur as broad areas along the Yazoo River. Much of the area is wooded. The common commercial trees are green ash, eastern cottonwood, red maple, sweetgum, and oaks of various species. The understory consists chiefly of swamp-privet, planertree, low bushes, and vines.

The surface layer is dark-brown clay, and the subsoil is gray clay mottled with yellow and brown.

These soils occur with the Commerce, Wakeland, Dowling, and Sharkey soils. They are finer textured than the Commerce and Wakelands soils and less well drained. They are lighter gray than the Sharkey soils, and they are better drained than the Dowling soils, which occupy the depressions.

Poor drainage and dense plastic clay limit the suitability of these soils for cultivation.

Alligator clay (Ar).—This is a poorly drained soil in the slack-water area. Major horizons in profile:

0 to 4 inches, dark-brown, plastic clay.
4 to 30 inches, gray, plastic clay mottled with strong brown and yellowish brown.
30 to 46 inches, gray to light-gray, massive, plastic clay mottled with yellowish brown.

The color of the surface layer ranges from dark gray to light gray, and the texture is clay or silty clay.

Small areas of Dowling and Sharkey soils are included in the areas mapped.

Alligator clay is strongly acid. It is high in natural fertility. The surface layer has poor tilth and is low in organic-matter content. The slowly permeable surface layer and subsoil are very sticky when wet, and they harden and crack when dry.

This soil is suited to permanent pasture, soybeans, small grain, and hardwoods. Cultivation is feasible within only a narrow range of moisture content. The rate of infiltration and the internal water movement are slow. Removing surface water is a problem. A considerable acreage is open and is used as pasture, and the rest is in hardwood forest. (Capability unit IIIw–3; woodland suitability group 2.)

Bowdre Series

The Bowdre series consists of nearly level, moderately well drained, clayey soils that formed in fine-textured sediments over medium-textured material, both deposited by the Mississippi River and its tributaries. These soils occur as small areas on the Mississippi alluvial plain in the western part of the county. The natural vegetation consisted of sweetgum, eastern cottonwood, hackberry, and oaks of various species. The understory consisted of swamp-privet, planertree, low shrubs, and vines.

The surface layer and the upper part of the subsoil are dark grayish-brown silty clay. Brown fine sandy loam mottled with grayish brown occurs about 15 inches beneath the surface. Natural fertility is high, organic-matter content is low, and reaction is slightly acid to mildly alkaline.

These soils are associated with the Tunica, Sharkey, Dowling, and Commerce soils on level areas adjacent to natural levees. The Bowdre soils differ from the Sharkey and Tunica soils in being underlain at a depth of less than 20 inches by friable material. They are finer textured in the upper part of the profile than the Commerce soils. They are better drained than the Dowling soils, which are in depressions.

The Bowdre soils are suited to most of the commonly grown crops. About 80 percent of the acreage is now cultivated or used as pasture. The total acreage is small.

Bowdre silty clay (Bo).—This is a moderately well drained soil on the Mississippi alluvial plain. Major horizons in profile:

0 to 6 inches, very dark grayish-brown silty clay.
6 to 18 inches, very dark grayish-brown silty clay mottled with strong brown.
18 to 40 inches, brown to dark grayish-brown, friable fine sandy loam to loamy fine sand mottled with grayish brown.

The upper two layers of fine-textured sediments range from 10 to 20 inches in thickness. Their texture ranges from silty clay to clay. Beneath the fine-textured sediments, the texture ranges from fine sandy loam to loamy sand. Thin strata of sandy loam, silt, and clay of various colors occur in places.

Small areas of Tunica and Commerce soils are included in the areas mapped.

Bowdre silty clay is slightly acid to mildly alkaline, high in natural fertility, and low in organic-matter content. The surface layer has poor tilth. Both the surface

layer and the upper part of the subsoil are very sticky when wet, and they harden and crack when they dry.

Cultivation is feasible within only a narrow range of moisture content. The rate of infiltration and the internal movement of water are slow in the upper layers and moderate to rapid in the lower layers. V-type and W-type ditches are needed to remove excess surface water.

The total acreage is small, and about 80 percent of it is in cultivated crops or in pasture. The rest is in hardwood forest. (Capability unit IIIw-1; woodland suitability group 3.)

Calloway Series

The Calloway series consists of nearly level to gently sloping, somewhat poorly drained soils that have a strong fragipan. These soils formed in loess. They are on high terraces in the eastern part of the county, along the Big Black River. The native vegetation consisted of hardwoods and some shortleaf pine and loblolly pine. The understory consisted chiefly of shrubs, briers, vines, and grasses.

The surface layer is brown or grayish-brown silt loam, and the subsoil is mottled yellowish-brown, pale-brown, and light brownish-gray heavy silt loam. The fragipan is silt loam. It is about 18 inches beneath the surface and is 24 inches or more in thickness. Natural fertility is low, the organic-matter content is low, and the reaction is strongly acid.

These soils occur with the Grenada soils in nearly level areas. The Henry soils occupy level or depressed areas. The Calloway soils are more mottled and more poorly drained than the Grenada soils. They are better drained and browner than the Henry soils.

The Calloway soils are best suited to pasture. Most of the acreage is in pasture, a minor acreage is in row crops, and the rest is in forest.

Calloway silt loam (Co).—This is a somewhat poorly drained soil on the uplands. Major horizons in profile:

0 to 8 inches, brown silt loam.
8 to 18 inches, mottled yellowish-brown, pale-brown, and light brownish-gray heavy silt loam.
18 to 45 inches, mottled light brownish-gray and yellowish-brown heavy silt loam that is compact and brittle (fragipan).

The color of the surface layer ranges from dark grayish brown to pale brown. The subsoil is friable to firm. Above the fragipan, it ranges from 14 to 20 inches in thickness and from silt loam to silty clay loam in texture. The depth from the surface to the fragipan ranges from 16 to 24 inches.

Small areas of Henry and Grenada soils are included in the areas mapped.

Calloway silt loam is strongly acid, low in natural fertility, and low in organic-matter content. It can be tilled within only a fairly narrow range of moisture content; it is commonly too wet or too dry, depending upon the season. The fragipan restricts the depth to which roots can grow and thereby limits the amount of moisture available to plants. The soil responds well to fertilizer. Because surface runoff and the infiltration rate are slow, graded rows and W-ditches are needed to remove excessive surface water in wet periods.

The total acreage is small, and most of it is in pasture. (Capability unit IIIw-3; woodland suitability group 4.)

Collins Series

The Collins series consists of nearly level, moderately well drained soils that formed in alluvium washed from the loess hills. These soils occur mainly as small areas in the eastern part of the county. The native vegetation consisted of hardwoods. The chief commercial trees were eastern cottonwood, oaks of various species, southern magnolia, sweetgum, American sycamore, and black tupelo. The understory consisted of cane, grass, American holly, low shrubs, and vines.

The surface layer is brown to dark-brown silt loam, and the upper part of the subsoil is brown to very dark brown silt loam. Brownish-gray mottles begin at a depth of about 20 inches. Natural fertility is moderate to high, organic-matter content is low, and reaction is medium acid.

These soils occur with the Falaya, Waverly, and Adler soils in a few of the stream valleys in the loessal uplands. They are browner than the Falaya and Waverly soils and better drained. They are similar to the Adler soils in drainage and texture but are acid rather than alkaline.

Most of the acreage of Collins soils in this county is now cultivated or is in pasture.

Collins silt loam (Cl).—This is a moderately well drained, friable, acid soil that is subject to overflow. Major horizons in profile:

0 to 20 inches, brown to dark grayish-brown silt loam.
20 to 30 inches, mottled pale-brown, light-gray, brown, dark-brown, and yellowish-brown silt loam.
30 to 40 inches, mottled light-gray silt loam.

The color of the surface layer ranges from grayish brown to brown. The color of the subsoil above the mottled layers ranges from brown to dark brown. Depth to mottling ranges from 18 to 30 inches.

Small areas of the Falaya and Waverly soils are included in the areas mapped.

This soil is moderate to high in natural fertility and low in organic-matter content. It has a thick root zone and works easily but tends to crust and pack when bare. Movement of water into and through the soil is moderate, and the available moisture capacity is high. The reaction ranges from slightly acid to strongly acid.

This is one of the most productive soils in the county. It is well suited to a wide range of plants. It is subject to frequent overflow of short duration, and W-type ditches are needed in some places to remove the excess water. Streambank caving and overfalls occasionally are problems.

Most of the acreage is in cultivated crops or in pasture, but some of the small areas that are not easily reached are in hardwood forest. (Capability unit IIw-3; woodland suitability group 5.)

Collins silt loam, local alluvium (Cm).—This soil formed in alluvium washed from the loess hills. It occurs on moderately wide bottoms adjacent to the uplands, with Collins silt loam but at a higher elevation. It is flooded less frequently and for shorter periods than Collins silt loam. The local alluvium, which overlies older material, is at a depth of 18 inches or more.

This soil has fairly good tilth, responds to management, [illegible] and the available moisture capacity is high. All of the acreage is in cultivated crops or in pasture. V-type and W-type ditches are needed for drainage. The total acreage is small. (Capability unit IIw-3, woodland suitability group 5.)

Commerce Series

The Commerce series consists of nearly level, moderately well drained and somewhat poorly drained soils that formed in medium textured and moderately fine textured alluvium from the Mississippi River. These soils occur in small, to fairly large areas on recent natural levees in the western part of the county. The native vegetation [illegible]

The Commerce soils occur with the Crevasse, Robinsonville, Tunica, Alligator, and Sharkey soils. They are finer textured than the Crevasse and Robinsonville soils and less well drained. They are more friable than the Tunica, Alligator, and Sharkey soils and lack the char[illegible]

Commerce silt loam [illegible]

[illegible]

Small areas of [illegible] and Bowdre soils [illegible]

[illegible]

V-type and W-type ditches are needed in some places to remove excess surface water in wet periods. About 60 percent of the acreage is open and is cultivated or is used as pasture. (Capability unit I-2, woodland suitability group 7.)

Commerce silty clay loam (Co).—This soil is on the lower parts of recent natural levees. Its profile is similar to that of Commerce silt loam, except for the texture of the surface layer.

Small areas of Bowdre soils and of Commerce silt loam are included in the areas mapped.

The texture of the surface layer makes good tilth difficult to maintain. The root zone is deep, and the available moisture capacity is high. Movement of water is slower [illegible] runoff and slow infiltration, graded rows and V-type and [illegible]

Most of the acreage is open and is in row crops or pasture. The rest is in hardwood forest. (Capability unit IIw-1, woodland suitability group 7.)

Commerce very fine sandy loam (Cp).—This soil is similar to Commerce silt loam but is coarser textured throughout and is more permeable.

Small areas of Robinsonville loam and Commerce silt loam are included in the areas mapped.

[illegible] the same way as Commerce silt loam. It is somewhat more easily worked than Commerce silt loam and is less likely to crust. (Capability unit I-2, woodland suitability group 7.)

Commerce, Robinsonville, and Crevasse soils (Cr).—Because of some similarity among these soils, the mixed [illegible] practical to map these soils separately in some parts of the county. The Commerce soils make up about 60 percent of this unit, the Robinsonville soils, about 25 percent, and the Crevasse soils, about 15 percent. Some areas consist of only one or two of the soils, but most areas include all three.

Major horizons in profile of Commerce silty clay loam:

[illegible]

Major horizons in profile of Robinsonville very fine sandy loam:

0 to 18 inches, brown to dark-brown, friable very fine sandy [illegible]

[illegible]

18 to 42 inches +, dark-gray, friable very fine sandy loam.

Major horizons in profile of Crevasse loamy fine sand:

[illegible] fine sand.

[illegible] fine sand.

The Commerce soils generally have a surface layer of dark grayish-brown silty clay loam or silt loam; the upper part of the subsoil generally is dark grayish-brown silty clay loam mottled with yellowish brown; and the lower part of the subsoil is pale-brown very fine sandy loam. The Robinsonville soils generally have a surface layer of brown very fine sandy loam and a subsoil of brown to dark

grayish-brown fine sandy loam. The Crevasse soils generally have a surface layer of brown loamy fine sand [illegible] gray [illegible]

The Commerce soils are moderately well drained and somewhat poorly drained, the Robinsonville soils are well drained, and the Crevasse soils are excessively drained. All are slightly acid to mildly alkaline, and all are subject to overflow.

The infiltration rate, the internal movement of water, and the available moisture capacity are variable. The organic-matter content generally is low. Natural fertility [illegible] mildly alkaline.

These soils are flooded occasionally. The entire acreage [illegible] hardwood forest. (Capability unit Vw-1, woodland suitability group 7.)

Crevasse Series

The Crevasse series consists of nearly level, somewhat excessively drained and excessively drained soils that formed in coarse-textured alluvium deposited by the Mississippi River. These soils occur as small areas on recent natural levees along the river. The forest cover consisted of black willow, eastern cottonwood, and sycamore. The understory consisted chiefly of bushes and vines.

The surface layer generally is dark grayish-brown sandy [illegible] Natural fertility is low, organic-matter content is low, and reaction is neutral or mildly alkaline.

These soils occur with the Robinsonville and Commerce soils. They are coarser textured, more permeable, and less productive than the associated soils.

The Crevasse soils are not suited to most row crops, because of droughtiness. Most of the acreage is used for pasture.

Crevasse fine sandy loam (Cv).—Major horizons in profile—

[illegible] friable sandy loam.
[illegible]
[illegible]
28 to 41 inches, pale-brown, very friable fine sandy loam with strata of loamy sand.

The color of the surface layer ranges from very dark grayish brown to pale brown, and the texture from fine sandy loam to sand. The texture of the subsoil ranges from loamy sand to sand, and the color from dark grayish brown to pale brown.

This soil is low in natural fertility, in organic-matter content, and in available moisture capacity. Reaction ranges from slightly acid to mildly alkaline. Infiltration and the internal movement of water are rapid.

This soil is best suited to permanent pasture. Droughtiness limits its use for row crops. Small grain for early grazing does well. (Capability unit IIIs-1, woodland suitability group 8.)

Dowling Series

The Dowling series consists of poorly drained soils that formed in slack-water deposits that included some loess alluvium. These soils are in long, narrow depressions that form part of the natural drainage pattern on the Mississippi [illegible] sisted of hardwoods and cypress. The understory consisted chiefly of planertree, swamp-privet, common buttonbush, low shrubs, and vines.

The surface layer generally is dark-gray clay, and the subsoil is dark grayish-brown clay mottled with brown [illegible] gray.

These soils are high in natural fertility, are low to moderate in organic-matter content, and range from slightly acid to mildly alkaline in reaction. They contract and crack when dry and expand and seal up when wet.

These soils occupy the depressions in areas of the Commerce and Robinsonville soils, which are on recent natural levees, and in areas of the Alligator, Sharkey, Tunica, and Bowdre soils, which are on slack-water flats.

The Dowling soils make up about 2 percent of the county. Most of their acreage is in forest, is idle, or is in pasture. They are not good agricultural soils.

Dowling clay (Do).—This is a poorly drained, clayey soil in depressions. Major horizons in profile—

[illegible]

In places the texture of the surface layer is silty clay. In a few places the profile contains thin strata of coarser textured material.

The reaction is mildly alkaline, and natural fertility is high. Water moves into and through this soil very slowly. The available water capacity is high, but slow surface drainage and poor physical properties make this soil difficult to manage. Flooding makes permanent pasture hard [illegible]

Some areas can be drained by means of V-type and [illegible] in many places. When drained, this soil is suited to soybeans, sorghum, and pasture. Nitrogen is the only fertilizer needed for most plants. (Capability unit Vw-2, woodland suitability group 9.)

Falaya Series

[illegible] story consisted chiefly of eastern redbud, possumhaw, common buttonbush, shrubs, and grasses.

The surface layer is brown to dark grayish-brown silt loam. It is underlain by dark-brown silt loam that becomes mottled 7 to 18 inches below the surface. Natural fertility is moderate, organic-matter content is low, and reaction is medium acid.

The Falaya soils occur with the Collins and Waverly soils on first bottoms. They are more mottled and less well drained than the moderately well drained Collins soils. They are browner and better drained than the Waverly soils, which are gray and poorly drained.

The Falaya soils make up about 3 percent of the county. They are suited to a wide range of crops and pasture plants. Most of the acreage is now in cultivated crops or in pasture.

Falaya silt loam (Fa).—This is a somewhat poorly [illegible] and is likely to be flooded. Major horizons in profile [illegible]

The color of the surface layer ranges from dark grayish [illegible] pale brown. The subsoil generally is mottled [illegible] from silt loam to heavy silt loam. The subsoil is [illegible] loam.

Small areas of Collins and Waverly silt loams are [illegible] good tilth. Water moves into and through [illegible] bility unit IIw-4; woodland suitability group 6.)

Falaya silt loam, local alluvium [illegible] and overlies a more developed profile.

This soil has fairly good tilth but tends to crust and [illegible] The root zone is thick. Overflow is of shorter dura[illegible] hazard to farming, and V-type and W-type ditches are [illegible] unit IIw-4, woodland suitability group 6.)

Grenada Series

The Grenada series consists of nearly level to moderately sloping, moderately well drained soils that have a strong fragipan. These soils formed in loess. They [illegible] small to fairly large areas on high terraces in the eastern part of the county. The native vegetation consisted of hardwoods and some shortleaf pine and loblolly [illegible] The understory consisted chiefly of dogwood, holly, [illegible] horn, shrubs, and grasses.

In areas that have not been eroded, the surface layer is dark-brown or dark grayish-brown silt loam, and the subsoil is dark-brown silty clay loam. The fragipan is silt loam. It is about 22 inches beneath the surface and is 24 inches or more thick. Natural fertility is low to moderate, organic-matter content is low, and reaction is strongly acid.

These soils occur with the Memphis and Loring soils in [illegible]ly level to strongly sloping areas. They are less well drained than the Memphis soils, which lack a fragipan. They are also less well drained than the Loring soils, and they have a more distinct fragipan. They are better [illegible] which occupy nearly level or depressed areas.

The Grenada soils are suited to most of the commonly grown crops. Most of the acreage is now in cultivated [illegible]

Grenada silt loam, 0 to 2 percent slopes (GrA).—This is a moderately well drained soil on the uplands. Major horizons in profile [illegible]

In cultivated areas, the plow layer is dark grayish brown. The subsoil ranges from 16 to 20 inches in thickness, from dark brown to dark yellowish brown in color, and from silt loam to silty clay loam in texture. The depth to the fragipan ranges from 18 to 24 inches.

Small areas of Loring, Calloway, and Henry silt loams [illegible] cluded in the areas mapped.

This soil is strongly acid, moderate to low [illegible] is fairly easy to keep in good tilth but will crust and [illegible] which roots can grow and thereby limits the amount of moisture available to plants.

This soil responds well to fertilizer. Because of slow [illegible] W-type ditches generally are needed to remove excess [illegible] unit IIw-2; woodland suitability group 4.)

Grenada silt loam, 2 to 5 percent slopes (GrB).—The [illegible] layer of this soil is 1 to 2 inches thinner than that of the Grenada silt loam, 0 to 2 percent slopes. Because of its stronger slope, this soil has better surface drainage. Small areas of Loring and Calloway silt loams are included in the areas mapped.

This soil is suited to a wide range of crops, but it is moderately susceptible to erosion. The acreage that is [illegible] bility unit IIe-2; woodland suitability group 4.)

Grenada silt loam, 2 to 5 percent slopes, eroded (GrB2).—The surface layer of this soil is 2 to 4 inches thinner than that of Grenada silt loam, 0 to 2 percent slopes. Surface runoff is more rapid than on the nearly level soil, and the erosion hazard is somewhat greater. In a few areas the plow layer extends into the subsoil. Small areas of Loring and Calloway soils are included in the areas mapped.

This soil is suited to a wide range of crops, but if it is cultivated careful management is required for control of [illegible] The total acreage is small. Most of this is in cultivated crops and in permanent pasture. (Capability unit IIe-2; woodland suitability group 4.)

Grenada silt loam, 5 to 8 percent slopes, severely eroded (GrC3).—This soil has lost most or all of the original surface layer through erosion. A few shallow gullies have formed. The present plow layer is predominantly brown to dark-brown heavy silt loam. Small areas of Loring silt loam are included in the areas mapped.

Grenada silt loam, 5 to 8 percent slopes, severely eroded, is suited to a wide range of crops, but if it is cultivated [illegible] The erosion hazard is moderate to sev[illegible]

The total acreage is small. Most of it is in pasture (Capability unit IVe-2; woodland suitability group 4.)

Gullied Land

Gullied land consists of loessal areas so deeply gullied that it is not practical to classify the material as soil. The gullies have cut into the unweathered loessal parent material. This land type occurs as scattered areas throughout the county, except on the flood plain of the Mississippi River. It makes up about 7 percent of the county.

Gullied land (Gu).—This land type consists of areas formerly used for row crops but now intricately dissected by deep and shallow gullies. Cultivation of these areas in their present condition is not possible, and reclamation would be very slow and expensive.

Gullied land is mostly wooded, but a small acreage is in pasture. (Capability unit VIIe-2; woodland suitability group 10.)

Henry Series

The Henry series consists of nearly level, poorly drained soils that have a fragipan. These soils formed in loess [illegible] Black River in the eastern part of the county. The native vegetation consisted of hardwoods and scattered pine. The understory consisted of low shrubs and vines.

The surface layer is brown silt loam, and the subsoil is mottled pale-brown, gray, and yellowish-brown heavy silt loam. The fragipan is heavy silt loam. It is about 15 inches beneath the surface and is 24 inches or more thick. Natural fertility is low, organic-matter content is low, and reaction is strongly acid.

These soils occur with the Calloway, Grenada, Loring, and Memphis soils. They are more poorly drained than the Calloway soils. They are grayer, more poorly drained, and shallower to the fragipan than the Loring and Grenada soils. They are also more poorly drained than the Memphis soils, which lack a fragipan.

The Henry soils are suited to trees, to pasture, and to a limited number of row crops. They make up about 0.1 percent of the county.

Henry silt loam (Hn).—This poorly drained soil [illegible]

Major horizons in profile

[illegible]

The color of the surface layer ranges from dark grayish brown [illegible] zon (subsoil) ranges from silt loam to light silty clay loam. [illegible] There are many concretions of manganese and iron above and within the fragipan.

This soil is strongly acid in reaction, low in natural fertility, and low in organic-matter content. The surface layer is difficult to keep in good tilth. Most of the time it [illegible] The fragipan restricts the depth to which roots can grow and thereby [illegible] poorly aerated for fairly long periods. Consequently, only a few kinds of crops can be grown.

The total acreage is fairly small. Much of it has been cleared. Most of the acreage is in pasture, but some is in row crops. (Capability unit IIIw-2; woodland suitability group [illegible])

Loring Series

The Loring series consists of nearly level to moderately sloping, moderately well drained to well drained soils that have a weak fragipan. These soils formed in loess. They [illegible] the eastern and central parts of the county. The native vegetation consisted of hardwoods and some shortleaf pine and loblolly pine. The understory consisted chiefly of dogwood, holly, hawthorn, low shrubs, and grasses.

In areas that have not been eroded, the surface layer is dark-brown silt loam, and the subsoil is dark-brown silty clay loam. The fragipan is silt loam. It is about 32 [illegible] Natural fertility is moderate, organic-matter content is low, and reaction is strongly acid.

These soils occur with the Grenada and Memphis soils on nearly level to strongly sloping uplands. [illegible] Memphis soils. They are better drained than the Grenada soils and have a weaker fragipan. They are better drained and browner than the Calloway and Henry soils, which occupy nearly level and depressed areas.

Loring soils are suited to most of the commonly grown crops. Most of the acreage is cultivated or is used for pasture.

In Warren County, the Loring soils are mapped [illegible] of a Loring soil are described under the heading "Memphis and Loring silt loams, 2 to 5 percent slopes, severely eroded."

Memphis Series

The Memphis series consists of nearly level to very steep [illegible] occur throughout the uplands of Warren County. They [illegible] They are mapped alone and also in undifferentiated groups with soils of other series. The native vegetation consisted [illegible] The understory consisted chiefly of dogwood, holly, hawthorn, shrubs, and grasses.

In areas that have not been eroded, the surface layer is dark-brown or dark grayish-brown silt loam. The subsoil is dark-brown silty clay loam. Natural fertility is moderate, organic-matter content is low, and reaction is strongly acid.

These soils occur with the Loring and the Grenada soils on nearly level to strongly sloping uplands. On the steeper slopes adjacent to Memphis soils are the Natchez soils. The Calloway and Henry soils occupy nearly level or depressed areas. The Memphis soils are more acid than

the Natchez soils, which are moderately alkaline in the lower part. The Memphis soils have a subsoil of silty clay loam, and the Natchez soils have a subsoil of silt loam. The Memphis soils are better drained and have a deeper root zone than the Loring, Grenada, Calloway, and Henry soils, all of which have a fragipan.

Memphis soils are well suited to most of the commonly grown crops. Most of their acreage now is cultivated or is in pasture.

Memphis silt loam, 2 to 5 percent slopes, eroded (MeB2).—This is a well-drained soil on the uplands. Major horizons in profile—

[illegible]

The color of the surface layer ranges from dark yellowish brown to dark grayish brown or brown. The texture of the subsoil ranges from silty clay loam to silt loam.

Small areas of Loring and Grenada soils are included in the areas mapped.

[illegible] soil is strongly acid, the natural fertility is moderate, [illegible] fairly easy to keep in good tilth but will crust when bare [illegible] able to meet the needs of most plants.

[illegible] It is well suited to a wide range of cultivated crops. When [illegible] total acreage is small. (Capability unit IIe-1; woodland suitability group 12.)

Memphis silt loam, 0 to 2 percent slopes (MeA).—The [illegible] of Memphis silt loam, 2 to 5 percent slopes, eroded. Small [illegible]

[illegible] This nearly level soil has good internal drainage, slow infiltration, and high available moisture capacity. The [illegible] is thick. Natural fertility is moderate. Surface runoff is slow; thus, the hazard of erosion is only slight.

[illegible] soil responds well to fertilizer and is suited to [illegible] kinds of crops. Because of slow surface runoff and slow infiltration, graded rows are needed to [illegible] excess surface water during wet periods. The total acreage is small, and all of it is in cultivated crops or in pasture. (Capability unit I-1; woodland suitability group 12.)

Memphis silt loam, 2 to 5 percent slopes (MeB).—The surface layer of this soil is 2 to 4 inches thicker than that of Memphis silt loam, 2 to 5 percent slopes, eroded. Small areas of Loring and Grenada silt loams are included in the areas mapped.

This soil is suited to a wide range of crops but is moderately susceptible to erosion. It is used for cultivated crops and pasture. The acreage is small. (Capability unit IIe-1; woodland suitability group 12.)

Memphis silt loam, 2 to 5 percent slopes, severely eroded (MeB3).—The surface layer of this soil is 2 to 4 inches thinner than that of Memphis silt loam, 2 to 5 percent slopes, eroded. The plow layer ordinarily extends [illegible] heavy silt loam. Small areas of Loring and Grenada soils [illegible] included in the areas mapped.

[illegible] cultivated, careful management is required for control of [illegible]. The total acreage is small. Most of it is in cultivated crops and permanent pasture. (Capability unit IIIe-1; woodland suitability group 12.)

Memphis silt loam, 5 to 8 percent slopes, eroded (MeC2).—This soil is suited to a wide range of crops, but the erosion hazard is moderate to severe in cultivated areas. The total acreage is small, and most of it is in pasture. (Capability unit IIIe-1; woodland suitability group 12.)

Memphis silt loam, 5 to 8 percent slopes, severely eroded [illegible] inches thinner than that of Memphis silt loam, 2 to 5 percent [illegible] brown heavy silt loam. A few shallow gullies have formed. Small areas of Loring silt loam are included in the areas mapped.

Memphis silt loam, 5 to 8 percent slopes, severely eroded, is suited to a wide range of crops. It is moderately to highly susceptible to erosion, and if it is cultivated, [illegible] careful management is required. Most of the acreage is cultivated. (Capability unit IIIe-1; woodland suitability group 12.)

Memphis and Loring silt loams, 2 to 5 percent slopes, severely eroded (MlB3).—Because of the similarity of the soils and the mixed pattern of occurrence, it [illegible] to map these soils separately. These soils are eroded [illegible] the original surface layer and the upper part of the subsoil [illegible] surface layer is predominantly brown to dark-brown heavy silt loam. The Memphis soil makes up about 60 percent of the unit. Some areas consist entirely of Loring soils, and some entirely of Memphis soils, but [illegible] of both.

Major horizons in profile of Memphis silt loam—

[illegible]

The texture of the Memphis surface layer ranges from silt loam to silty clay loam. The texture of the subsoil ranges from heavy silt loam to silty clay loam.

Major horizons in profile of Loring silt loam—

[illegible]

8 inches +, brown or dark-brown silt loam; compact and brittle; friable when disturbed; weak fragipan.

The texture of the Loring surface layer ranges from silt loam to silty clay loam. The texture of the subsoil ranges from heavy silt loam to silty clay loam. The depth to the fragipan varies between 26 and 36 inches.

The Loring soil is moderately well drained to well drained and the Memphis soil is well drained.

These soils can be worked fairly easily, and they have a thick root zone. The movement of water into the soils is [illegible] able water capacity is high. The organic-matter content [illegible] is medium to strongly acid.

These soils are suited to a wide range of crops, but if [illegible] erosion. The total acreage is small. Most of it is in pas- [illegible] suitability group 12.)

Memphis and Loring silt loams, 0 to 2 percent slopes (MnA).—The surface layer of the soils in this unit is 3 to 6 inches thicker than that of Memphis and Loring silt loams, 2 to 5 percent slopes, severely eroded. Surface [illegible] than on the stronger slopes. [illegible] water-holding capacity is high. The root zone is thick. Natural fertility is moderate. [illegible] The total acreage is small, and all of it is in cultivated crops or in pasture. (Capability unit I-1, woodland suitability group 12.)

Memphis and Loring silt loams, 2 to 5 percent slopes (MlB).—The surface layer of the soils in this unit is 3 to 6 inches thicker than that of Memphis and Loring silt loams, 2 to 5 percent slopes, severely eroded. Small areas of Grenada silt loam are included in the areas mapped.

These soils are suited to a wide range of crops but are moderately susceptible to erosion. They are used for cultivated crops and as pasture. The acreage is small. (Capability unit IIe-1, woodland suitability group 12.)

Memphis and Loring silt loams, 2 to 5 percent slopes, eroded (MlB2).—The surface layer of the soils in this unit is 2 to 4 inches thicker than that of Memphis and Loring silt loams, 2 to 5 percent slopes, severely eroded. In a few areas the plow layer extends into the subsoil. Small areas [illegible] soils are included in the areas mapped.

[illegible] soils are suited to a wide range of crops, but if they are cultivated, careful management is required for control of erosion. The total acreage is fairly small. Most of it is in crops and permanent pasture. (Capability unit IIe-1, woodland suitability group 12.)

Memphis and Loring silt loams, 5 to 8 percent slopes, eroded (MlC2).—The surface layer of the soils in this unit is 2 to 4 inches thicker than that of Memphis and Loring silt loams, 2 to 5 percent slopes, severely eroded.

These soils are suited to a wide range of crops but [illegible] moderately to highly susceptible to erosion. The acreage is small, and most of it is in pasture. (Capability unit IIIe-1, woodland suitability group 12.)

Memphis and Loring silt loams, 5 to 8 percent slopes, severely eroded (MlC3).—These soils are suited to a wide range of crops. They are moderately to highly susceptible to erosion, and if they are cultivated, very careful management is required. The total acreage is fairly [illegible] 1, woodland suitability group 12.)

Memphis and Natchez silt loams, 17 to 40 percent slopes, eroded (MnF2).—Because of the similarity of these soils and the mixed pattern of their occurrence, it was [illegible] fairly moderate. Most areas have lost between 25 and 75 percent of the original surface layer. Some small areas have most of the original surface layer, but other areas are eroded to the extent that the present surface layer consists largely of material from the upper part of the subsoil. Shallow gullies are fairly common, and deep ones have formed in some places.

The Memphis soils, which make up about 70 percent of this unit, are on narrow ridgetops and the upper part of the slopes. The Natchez soils are on the middle and lower parts of the slopes. Most areas include some of both soils.

Major horizons in profile of Memphis silt loam: [illegible]

The surface layer ranges from brown to dark brown in color and from silt loam to heavy silt loam in texture.

Major horizons in profile of Natchez silt loam: [illegible] silt loam; strongly [illegible] ly alkaline.

Water moves into these soils slowly, but the internal movement of water is medium. The available water capacity is high. Natural fertility is moderate. The root zone is deep.

Because of the steep slopes and a severe erosion hazard, these soils are not suited to row crops. Much of the acreage [illegible] woods. The total acreage is large. (Capability unit VIIe-1, woodland suitability group 10.)

Memphis and Natchez silt loams, 8 to 12 percent slopes, severely eroded (MnD3).—These soils are eroded to the extent that the present surface layer consists largely of the upper part of the subsoil. Shallow gullies [illegible] and deep ones have formed in some places.

These soils respond well to fertilizer. Because of the hazard of erosion, they are only fairly well suited to cultivation. A water disposal system that includes graded [illegible] and vegetated waterways is needed to control runoff. The total acreage is small. Most of it is in trees and pasture, and a small part is in row crops. (Capability unit IVe-1, woodland suitability group 10.)

Memphis and Natchez silt loams, 12 to 17 percent slopes, severely eroded (MnE3).—These soils have slower runoff than Memphis and Natchez silt loams, 17 to 40 percent slopes, eroded. They are eroded to the extent that the present surface layer consists largely of material from the upper part of the subsoil. Shallow gullies are common, and deep ones have formed in some places.

Because of the severe erosion hazard, these soils are not suited to row crops. They need to be kept in perennial vegetation. Much of the acreage has been cropped in the past, but most of it is now in hardwoods. (Capability unit VIe-1, woodland suitability group 10.)

Morganfield Series

The Morganfield series consists of friable, well-drained soils formed in loessal alluvium. These soils occur as small areas on the flood plains of a few of the local streams. The natural vegetation consisted mostly of hardwoods. The common trees were oak, sweetgum, sycamore, and yellow-poplar. The understory consisted chiefly of cane, American holly, shrubs, vines, and grasses.

The surface layer is brown silt loam, and the subsoil is dark-brown to dark yellowish-brown silt loam. Natural fertility is moderate to high, organic-matter content is low, and reaction is slightly acid to mildly alkaline.

Morganfield soils are associated with Collins and Adler soils. They are browner and better drained than either. Most of the acreage is cultivated or is used as pasture.

Morganfield silt loam (Md).—This is a well-drained, slightly acid to mildly alkaline, friable soil. It is on first bottoms and is likely to be flooded. Major horizons in profile:

[illegible]

The color of the surface layer ranges from dark grayish brown to brown or dark brown. The texture of both the surface layer and the subsoil ranges from silt loam to silt. Gray mottles occur below a depth of 30 inches in some areas.

Natural fertility is moderate to high, organic-matter [illegible] easy to keep in good tilth, but it crusts when [illegible] the available moisture capacity is high.

This is one of the most productive soils in the county. It is well suited to a wide range of plants. Floods are of short duration and only slightly damage crops. The acreage is very small. (Capability unit IIw-8; woodland suitability group [illegible])

Natchez Series

The Natchez series [illegible] pasture.

In areas that have not been eroded, the surface layer [illegible]

The Natchez [illegible] Memphis [illegible]

[illegible] They [illegible]

[illegible] a Natchez soil is included in the description of Memphis and Natchez silt loams, 17 to 40 percent slopes, eroded.

Robinsonville Series

The Robinsonville series consists of nearly level, well-drained soils that formed in medium-textured and moderately coarse textured sediments deposited by the Mississippi River. These soils are on recent natural levees in the western part of the alluvial plain along the Mississippi River. The original forest consisted of eastern cottonwood, hackberry, pecan, sweetgum, and American sycamore. The understory consisted chiefly of grass, shrubs, vines, and canes.

The surface layer is very dark grayish-brown loam, and [illegible] Natural fertility is high, the organic-matter content is low, and the reaction is slightly acid to moderately alkaline.

These soils occur with the Commerce and Crevasse soils. They are better drained than the Commerce soils and are mottled to a greater depth. They are finer textured than the Crevasse soils.

The Robinsonville soils are suited to a wide range of plants.

Robinsonville loam (Ro).—This is a well-drained, [illegible] friable, medium-textured soil on recent natural levees. Major horizons in profile:

[illegible]

In some areas the texture of the surface layer is silt loam. In the lower part of the profile, the texture ranges from loamy sand to very fine sandy loam.

This soil is high in natural fertility, low in organic [illegible] reaction. The surface layer is easy to keep in good [illegible] of moisture content. Movement of water into and through this soil is moderate. The available moisture capacity is adequate for most locally grown crops. The root zone is deep.

Drainage adequate to remove excess surface water in wet [illegible] and W-type ditches. The total acreage is small, and all of it is in cultivated crops or in pasture. (Capability unit I-2; woodland suitability group [illegible])

Sharkey Series

The Sharkey series consists of nearly level, poorly drained, clayey soils in slack-water areas. These soils formed in fine-textured alluvium deposited by the Mississippi River. They occur as fairly large areas in the western part of the county. The original forest consisted of green ash, eastern cottonwood, red maple, sweetgum, and oaks of various species. The understory consisted largely of planertree, swamp-privet, low bushes, and vines.

Both the surface layer and subsoil are dark-gray clay. The subsoil is mottled with brown. Natural fertility is high, organic-matter content is low, and reaction is slightly acid to mildly alkaline. These soils shrink and crack extensively when they dry and expand and seal when wet.

These soils occur with the Tunica and Bowdre soils, which are in the slack-water areas, with the Commerce [illegible] which are in [illegible] levees, and [illegible] the Dowling soils, which are in depressions. The Sharkey [illegible] Tunica and Bowdre soils, which are underlain by finer textured material. They are also more poorly drained than the Bowdre soils, which are underlain by coarser textured material at a depth of 10 to 20 inches.

Poor drainage, plastic consistence, and clay texture limit the suitability of this soil for cultivation. Areas that have been cleared are used for row crops and pasture. The crops best suited are soybeans and small grain.

Sharkey clay (Sc).—This is a poorly drained soil in slack-water areas. Major horizons in profile:

[illegible] inches, dark-gray, very plastic clay.
[illegible] inches, dark-gray [illegible] plastic clay; few, fine, distinct [illegible] mottles.
30 [illegible] inches +, dark-gray plastic clay; common, dark [illegible].

The color of the surface layer ranges from very dark gray to dark grayish brown, and the texture from clay to [illegible] ranges from [illegible] to dark grayish brown, and the number of mottles ranges from few to many.

This soil is high in natural fertility. When first cleared, it is fairly high in organic matter, but the organic-matter content decreases rapidly under cultivation. The reaction ranges from slightly acid to mildly alkaline. Water moves into and through this soil very slowly, except when the soil is cracked; then, it moves into the soil very rapidly until the cracks seal. The available moisture capacity is high.

This soil is difficult to manage because it remains wet for long periods after rains and is extremely hard when dry. V-type or W-type ditches are essential for surface drainage. The total acreage is fairly large. Approximately 70 percent of it is in hardwoods. The rest is in pasture and row crops. (Capability unit IIIw-3, woodland suitability group 2.)

Sharkey, Tunica, and Dowling clays (Sd).—This differentiated unit occurs as large wooded areas in the western part of the county. Because of the similarity of the soils, the mixed pattern of occurrence, and the heavy forest cover, it was impractical to map these soils separately.

Major horizons in profile of Sharkey clay:

[illegible] inches, dark-gray [illegible] plastic clay.
[illegible] inches, dark-gray [illegible] plastic clay; few, fine, [illegible] mottles.
30 [illegible] inches +, dark-gray [illegible] plastic clay; common, dark [illegible] mottles.

The color of the surface layer ranges from very dark gray to dark grayish brown, and the texture from clay to [illegible]. The color of the subsoil ranges from [illegible] gray to dark grayish brown, and the number of mottles varies between few and many.

Major horizons in profile of Tunica clay:

[illegible] inches, [illegible] clay [illegible].
[illegible] inches, dark-gray [illegible] plastic clay [illegible].
[illegible] inches, [illegible] silt loam [illegible] mottled with [illegible].

The thickness of the clay horizons ranges from 20 to 42 inches. The texture of the lower part of the subsoil ranges from sandy loam to silty clay loam.

Major horizons in profile of Dowling clay:

[illegible] inches, dark gray, plastic clay; few mottles [illegible].
[illegible] inches, dark grayish-brown, plastic clay; mottled with gray and strong brown.

In places the surface layer is silty clay. In a few places [illegible] profile.

Natural fertility of the soils in this mapping unit is high, the organic-matter content is low to moderate, and the reaction is slightly acid to moderately alkaline. Infiltration of moisture is slow. The internal movement of water is slow in the Sharkey and Dowling soils. It is slow in the upper part of the subsoil of the Tunica soils, but it is moderate in the lower part. The available water capacity is high.

Inadequate surface drainage and poor physical properties [illegible] drainage. Because of the severe hazard of overflow, the entire acreage is in hardwood forest. Much of the forest [illegible] is of little commercial value. (Capability unit Vw-2, woodland suitability group 2.)

Silty Land

Silty land consists of material that is similar to that of the Memphis and Natchez silt loams but has been altered greatly by man. Cuts and fills have been made for building sites. Areas of this land type occur in the city of Vicksburg. The total area is small.

Silty land, rolling (SsC).—Areas of this land type are moderately sloping and steep.

Water moves into this soil material fairly slowly. The [illegible] moisture capacity is high, and runoff is generally rapid. The reaction ranges from strongly acid to moderately alkaline.

This land type is suitable for building sites, parks, and [illegible] a wide range of [illegible] turf grasses, annual flowers, ornamental trees, shrubs, and vines. (Capability unit VIIIs-1.)

Silty land, steep (SsF).—Except for slope, this land type is like Silty land, rolling. Its uses are the same. (Capability unit VIIIs-1.)

Swamp

Swamp consists of very poorly drained soils that are wet [illegible] of the county adjacent to the Big Black River. The other is in the western part of the county on the alluvial flood plain of the Mississippi River. The [illegible] of water tupelo, swamp tupelo, swamp blackgum, bald [illegible] species. The understory consists chiefly of planertree, swamp-privet, common buttonbush, low shrubs, and vines.

Swamp (Sw).—This land type is in low, wet places that are flooded frequently. Because of excess water and thick vegetation, thorough examination is not feasible. Consequently, the soil material has not been classified. It generally consists of a mixture of sediments deposited by floodwaters from overflowing streams.

The surface layer in most places consists of dark-colored, acid soil and is 4 to 12 inches thick. The underlying [illegible]

terial varies in color and in texture and ranges from strongly acid to moderately alkaline.

Because of poor drainage and frequent floods, this land type is best suited to trees. (Capability unit VIIw-1; woodland suitability group 9)

Tunica Series

The Tunica series consists of nearly level, somewhat poorly drained, clayey soils. These soils formed in fine-[illegible] deposited by the Mississippi River. They are on the [illegible] in the western part of the county. The native vegetation consisted of sweetgum, eastern cottonwood, hackberry, and oaks of various species. The understory consisted of planertree, swamp-privet, low shrubs, and [illegible].

The surface layer is very dark grayish-brown silty clay. The upper part of the subsoil is dark-gray clay mottled with brown. It is underlain by coarser textured material, chiefly silt loam and sandy loam mottled with brown, which is about 24 inches below the surface. Natural fertility is high, organic-matter content is low, and reaction is slightly acid to mildly alkaline.

These soils occur with the Commerce, Bowdre, Sharkey, and Dowling soils. They are finer textured and less stratified than the Commerce soils. They have a thicker layer of clay than the Bowdre soils and are more poorly drained. They are at slightly higher elevations [illegible] than the Sharkey soils and are underlain by coarser [illegible] Dowling soils, which occupy the depressions.

[illegible] trees.

Tunica silty clay (Tu).—This is a somewhat poorly [illegible]

[illegible]
[illegible] brown or dark brown, and yellowish brown.
24 to 40 inches +, grayish-brown, friable silt loam mottled [illegible]

The thickness of the clay horizon ranges from 20 to 42 [illegible] sandy loam to silty clay loam.

Small areas of Sharkey and Bowdre soils are included in the areas mapped.

Water moves into and through this soil slowly except when the surface is dry and cracked; then, it moves rapidly until the cracks seal. Natural fertility is high, available moisture capacity is high, and organic-matter content is low.

The fine textured surface layer makes tillage very difficult. The total acreage is fairly small, and all of this is in cultivated crops or in pasture. (Capability unit [illegible]; woodland suitability group [illegible])

Wakeland Series

The Wakeland series consists of friable, somewhat poorly drained soils that formed in silty material washed from the loessal uplands. These soils are on small flood plains in the loess hills and in narrow bands on the alluvial plain next to the loess hills. The native vegetation of commercial value consisted of eastern cottonwood, red maple, [illegible] The understory consisted chiefly of eastern redbud, pos-[illegible]

The surface layer is brown to dark grayish-brown silt loam and is about 7 to 10 inches thick. It is underlain by mottled silt loam. Natural fertility is moderate, organic-matter content is low, and reaction is mildly alkaline.

These soils occur with the Adler, Collins, and Falaya soils. They are less well drained than the Adler and the Collins soils, which are moderately well drained. They are similar to the Falaya soils in drainage. In reaction, they differ from both the Falaya and Collins soils, which are medium acid.

These soils are suited to a wide range of crops and pasture. [illegible] as pasture.

Wakeland silt loam (Wa).—This is a somewhat poorly drained, mildly alkaline, friable soil. It is on first bottoms and is likely to be flooded. Major horizons in profile:

[illegible]

The color of the surface layer ranges from dark grayish brown to grayish brown, and the texture from silt loam [illegible] of brown and gray. In some areas, however, gray [illegible] dominantly silt loam, but in some areas it is light silty clay loam.

Small areas of Adler and Waverly soils are included in the areas mapped.

Natural fertility is moderate to high [illegible] mildly alkaline. The surface layer is fairly easy to keep in good tilth but will crust when bare. The movement of water into and through the soil is moderate, and [illegible] is available to plants in large [illegible].

Flooding and somewhat poor drainage are the [illegible] limitations. Well-arranged crop rows and [illegible] ditches help to remove excess surface water. The total acreage is fairly large. Most of it is in cultivated crops and in pasture. The rest is in hardwoods. (Capability unit IIw-4; woodland suitability group 1)

Wakeland silt loam, local alluvium (Wd).—This soil [illegible] depressions, on foot slopes in the long [illegible] bottoms, and along and at the head of small drainageways. Floods are usually of shorter duration than on Wakeland silt loam.

This soil has a thick root zone and is in good tilth. It is suited to a wide range of crops and can be used intensively. Improved drainage is the main limitation. The small total acreage is mostly in cultivated crops or in pasture, but [illegible] not easily reached are in hardwoods. (Capability unit IIw-4; woodland suitability group 1)

Waverly Series

The Waverly series consists of friable, poorly drained soils that formed in silty material washed from the loessal uplands. These soils occur with the Falaya soils as large

[illegible]
The native vegetation consisted chiefly of baldcypress, ash, [illegible] consisted chiefly of planertree, swamp privet, common buttonbush, low shrubs, and vines.

The surface layer is dark grayish-brown silt loam. It is underlain by light gray silt loam mottled with brown. Natural fertility is moderate, organic-matter content is low, and reaction is strongly acid.

These soils are associated with the Falaya and the Collins soils on first bottoms. They are more mottled and more poorly drained than the somewhat poorly drained Falaya soils and the moderately well drained Collins soils. Overflow and a seasonally high water table make the Waverly soils unsuitable for row crops. Only a few small areas have ever been cleared, and they are now in trees.

In Warren County, the Waverly soils are mapped only [illegible]

Waverly and Falaya silt loams (Wf).—Because of mixed pattern of occurrence and the heavy forest growth, it was impractical to map Waverly and Falaya soils separately in some parts of the county. The Waverly soils make up about 70 percent of this unit, and the Falaya soils about 30 percent. Some areas consist entirely of Waverly soils, and some of Falaya soils, but most areas include some of both.

Major horizons in profile of Waverly silt loam:

[illegible]

The texture of the surface layer is silt loam or heavy silt loam. The texture of the subsoil ranges from silt loam to silty clay loam.

Major horizons in profile of Falaya silt loam:

[illegible]

The color of the surface layer ranges from dark grayish [illegible] with shades of brown and gray, but in some areas gray is the dominant color. The texture of the surface layer is silt loam or heavy silt loam. The texture of the subsoil is predominantly silt loam, but in some areas it is light silty clay loam.

Small areas of Collins soils are included in the areas mapped.

Overflow and a high water table make this soil unsuitable for most row crops. Only a few small areas have ever been cleared, and they are again in trees. (Capability unit IVw-1; woodland suitability group 9.)

Use and Management of the Soils

This section discusses the use and management of soils for crops, trees, and wildlife and describes the soil characteristics that affect engineering.

Capability Groups of Soils

[illegible] a general way, how suitable soils are for most kinds of farming. It is a practical grouping based on limitations [illegible] they respond to treatment.

In this system all the kinds of soil are grouped at three levels, the capability class, the subclass, and the unit. The eight capability classes in the broadest grouping are designated by Roman numerals I through VIII. In class I are the soils that have few limitations, the widest range of use, and the least risk of damage when they are used. The soils in the other classes have progressively greater natural limitations. In class VIII are soils and landforms so rough, shallow, or otherwise limited that they do not produce worthwhile yields of crops, forage, or wood products.

The subclasses indicate major kinds of limitations within the classes. Within most of the classes there can be as many as four subclasses. The subclass is indicated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation [illegible] drained; *w* means that water in or on the soil interferes with [illegible] be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the country, indicates that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few or no limitations. Class V can contain, at the most, only subclasses *w*, *s*, and *c*, because the [illegible] limitations that confine their use largely to pasture, range, [illegible]

Within the subclasses are the capability units, which are groups of soils enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping [illegible] Capability units are generally identified by numbers assigned locally, for example, IIe-1 or IIIw-2.

Soils are classified in capability classes, subclasses, and units in accordance with the degree and kind of their permanent limitations, but without consideration of major and generally expensive landforming that would change the slope, depth, or other characteristics of the soil, and without consideration of possible, but unlikely, major reclamation projects.

The eight classes in the capability system, and the subclasses and units in this county, are described in the list that follows.

Class I.—Soils that have few limitations that restrict their use.

Unit I-1.—Deep, well drained, nearly level soils of the uplands.

Unit I-2.—[illegible] moderately well drained to somewhat poorly drained, loamy soils on natural levees.

Class II.—Soils that have some limitations that reduce the choice of plants or require moderate conservation practices.

Subclass IIe.—Soils subject to moderate erosion if they are not protected.

Unit IIe-1.—Deep, well-drained, gently sloping, loessal soils on the uplands.

Unit IIe-2.—Moderately well drained, loessal soils; fragipan.

Subclass IIw.—Soils that have moderate limitations because of excess water.

Unit IIw-1.—Moderately well drained to somewhat poorly drained, acid, alluvial soils on recent natural levees along the Mississippi River.

Unit IIw-2.—Moderately well drained, nearly level, loessal soils on the uplands; fragipan.

Unit IIw-3.—Nearly level, moderately well drained soils on the flood plains; subject to occasional floods.

Unit IIw-4.—Nearly level, somewhat poorly drained soils on the flood plains; subject to seasonal floods.

Unit IIw-5.—Nearly level, somewhat poorly drained soils on the uplands; fragipan.

Class III.—Soils that have severe limitations that reduce the choice of plants, or require special conservation practices, or both.

Subclass IIIe.—Soils subject to severe erosion if they are cultivated and not protected.

Unit IIIe-1.—Deep, well-drained, sloping, loessal soils; friable subsoil.

Subclass IIIw.—Soils that have severe limitations because of excess water.

Unit IIIw-1.—Nearly level, moderately well drained to somewhat poorly drained, clayey soils on the Mississippi River flood plain.

Unit IIIw-2.—Nearly level, poorly drained, acid soils; fragipan.

Unit IIIw-3.—Poorly drained, strongly acid to mildly alkaline clays on the Mississippi River flood plain.

Subclass IIIs.—Soils that have severe limitations of moisture capacity or tilth.

Unit IIIs-1.—Somewhat excessively drained, sandy soils on the Mississippi River flood plain.

Class IV.—Soils that have very severe limitations that restrict the choice of plants, or require very careful management, or both.

Subclass IVe.—Soils subject to very severe erosion if they are cultivated and not protected.

Unit IVe-1.—Deep, well-drained, strongly sloping, severely eroded soils; friable subsoil.

Unit IVe-2.—Strongly sloping, severely eroded, moderately well drained soils; fragipan.

Subclass IVw.—Soils that have very severe limitations because of excess water.

Unit IVw-1.—Level, poorly drained and somewhat poorly drained soils; severe flooding hazard.

Class V.—Soils not susceptible to little or no erosion but having other limitations, impractical to remove, that limit their use largely to pasture or range, woodland, or wildlife food and cover.

Subclass Vw.—Soils too wet for cultivation; drainage or protection not feasible.

Unit Vw-1.—Nearly level, somewhat poorly drained to somewhat excessively drained soils; severe flooding hazard.

Unit Vw-2.—Poorly drained and somewhat poorly drained clays; severe flooding hazard.

Class VI.—Soils that have severe limitations that make them generally unsuited to cultivation and that limit their use largely to pasture or range, woodland, or wildlife food and cover.

Subclass VIe.—Soils severely limited, chiefly by risk of erosion if protective cover is not maintained.

Unit VIe-1.—Well-drained, severely eroded, steep soils on the uplands; friable subsoil.

Class VII.—Soils that have very severe limitations that make them unsuitable for cultivation and restrict their use largely to pasture, woodland, or wildlife.

Subclass VIIe.—Soils very severely limited, chiefly by risk of erosion if protective cover is not maintained.

Unit VIIe-1.—Deep, well-drained, steep to very steep soils.

Unit VIIe-2.—Gullied land.

Subclass VIIw.—Soils very severely limited by excess water.

Unit VIIw-1.—Swamp.

Class VIII.—Soils and landforms that have limitations that preclude their use for commercial production of plants and restrict their use to recreation, wildlife, water supply, or esthetic purposes.

Subclass VIIIs.—Nonagricultural areas.

Unit VIIIs-1.—Moderately sloping to very steep areas altered by building operations.

In the following pages each capability unit is described, the soils in each are listed, and suggestions are given for use and management of the soils of each unit.

Capability unit I-1

This unit consists of well-drained, nearly level soils on the loessal uplands. The surface layer is about 9 inches thick. The texture of the subsoil is heavy silt loam to silty clay loam. The soils in this unit are—

Memphis silt loam, 0 to 2 percent slopes.
Memphis and Loring silt loams, 0 to 2 percent slopes.

These soils are moderate in natural fertility and are strongly acid. They have a thick root zone. They are fairly easy to keep in good tilth and can be cultivated throughout a fairly wide range of moisture content, but they will crust when bare. The response to fertilization is good. Infiltration is slow, but internal drainage is good. The available moisture capacity is high.

These soils are suited to cotton, corn, grain sorghum, soybeans, small grain, Coastal bermudagrass, common bermudagrass, dallisgrass, johnsongrass, bahiagrass, tall fescue, sudangrass, wild winter peas, vetch, alfalfa, red clover, white clover, annual and sericea lespedeza, and truck crops.

These soils have no apparent limitations and can be used for clean-tilled crops continuously if well managed. [illegible] to reduce crusting and packing and thereby increase infiltration. Because of the slow surface runoff and slow infiltration, graded rows are needed for the removal of excess water during wet periods.

Capability unit I–2

This unit consists of nearly level loamy soils on natural levees. The surface layer is 5 to 7 inches thick. The texture of the subsoil is fine sandy loam to silt loam. The soils in this unit are—

[illegible]

The Commerce soils are moderately well drained and somewhat poorly drained, and the Robinsonville soils are well drained.

These soils are high in natural fertility and slightly acid [illegible]. They are easy to keep in good tilth and can be cultivated [illegible] without clodding or crusting. Movement of water into and through these soils is moderate, and the available moisture capacity is moderate to high.

These soils are suited to cotton, corn, sorghum, soybeans, barley, oats, rye, wheat, common bermudagrass, Coastal [illegible] rescuegrass, ryegrass, sudangrass, alfalfa, annual lespedeza, crimson clover, vetch, wild winter peas, truck crops, and pecans.

These soils have no apparent limitations and can be used for clean-tilled crops continuously. Nitrogen is needed for row crops and for all pasture crops except legumes. Crop residues should be shredded and left on the surface as a mulch to reduce crusting and packing and thereby increase infiltration. Because of the nearly level topography and moderately slow infiltration, W-type [illegible]

Capability unit IIe–1

This unit consists of well-drained, gently sloping, loessal soils on the uplands. The surface layer is 4 to 6 inches thick. The texture of the subsoil is heavy silt loam to silty clay loam. The soils in this unit are—

[illegible]

These soils are moderate in natural fertility and are strongly acid. Their response to fertilization is good. The surface layer is fairly easy to keep in good tilth. Infiltration is fairly slow, but the internal movement of water is moderate. Enough moisture is available to meet the needs of most plants. Runoff is moderate, and erosion is a moderate hazard in cultivated areas. The root zone is thick. The Loring soils have a weak fragipan at a depth of 30 inches or more.

These soils are suited to cotton, corn, grain sorghum, soybeans, small grain, Coastal bermudagrass, common [illegible] fescue, sudangrass, wild winter peas, vetch, alfalfa, lespedeza [illegible]

Cropping systems and water-control measures designed to [illegible] against erosion. Vegetated waterways, graded rows, and on the longer slopes, terraces help to reduce the loss of soil through erosion. If water is controlled, these soils can be used continuously for clean-tilled crops. [illegible] vided by planting clean-tilled crops [illegible] 2 years of oats and lespedeza. Crop residues should [illegible] and thereby increase infiltration.

Capability unit IIe–2

This unit consists of moderately well drained, loessal soils that have a fragipan at a depth of about 22 inches. The texture of the subsoil is silt loam to silty clay loam. The soils in this unit are—

[illegible]

In wet weather, particularly in winter and in the early part of spring, these soils are likely to be saturated [illegible]. In [illegible] weather, they are likely to be slightly droughty because [illegible] above the fragipan.

These [illegible] strongly acid. They are fairly easy to keep in good [illegible] range of moisture content, but they will crust when bare. The response to fertilization is good. Runoff is medium. The root zone is restricted to the uppermost 2 feet, above the fragipan.

These [illegible] sorghum, small grain, Coastal bermudagrass, common [illegible] wild winter peas, vetch, annual and sericea lespedeza, crimson clover, white clover, and sudangrass. They also [illegible] to a limited number of truck crops.

Wetness in winter and dryness in summer are [illegible] moderate. Fair to good yields of all crops and pasture can be obtained.

Cropping systems and water-control measures designed to reduce and slow down runoff provide some protection against erosion. Graded rows, vegetated waterways, and terraces on the longer slopes help to reduce the loss of soil through erosion. Clean-tilled crops can be grown continuously if water is controlled. Another suitable cropping system consists of 2 years of row crops and 2 years of oats and lespedeza. Crop residues should be shredded [illegible] infiltration and helps maintain the organic-matter content.

[illegible] fertilizer is applied. Pastures can be damaged by trampling in winter and in the early part of spring, when the soils are wet.

Capability unit IIw–1

This unit consists of one moderately well drained to somewhat poorly drained soil on the recent natural levees of the Mississippi River flood plain. This soil formed [illegible]

alluvium. The surface layer is about 7 inches thick. The subsoil is mottled beginning at a depth of about 18 inches. The slope range is 0 to 2 percent. The soil is—

[illegible]

This soil is high in natural fertility and slightly acid [illegible] keep in good tilth and can be cultivated within only a [illegible] The erosion hazard is slight. Infiltration is slow, and the internal movement of water is restricted by a seasonal [illegible] The available moisture capacity is high.

This soil is suited to cotton, grain sorghum, soybeans, small grain, bahiagrass, common bermudagrass, Coastal bermudagrass, dallisgrass, johnsongrass, ryegrass, millet, rescuegrass, sudangrass, annual lespedeza, red clover, vetch, and wild winter peas.

If adequately drained, this soil can be used for [illegible] tilled crops continuously. Another suitable cropping system consists of 2 years of oats and lespedeza, then 2 years of row crops. Nitrogen is the only fertilizer used. Crop residues should be shredded and left on the surface as a mulch between crops, to reduce crusting and packing and thereby to increase infiltration. V-type and W-type ditches, field laterals, and graded rows generally [illegible] needed to remove surface water. Yields are good if adequate drainage is established.

Yields of pasture and hay crops are good. Nitrogen is needed for all grasses but not for legumes.

Capability unit IIw-2

This unit consists of one moderately well drained, nearly level, loessal soil on the uplands. The subsoil is silt loam or silty clay loam. A fragipan occurs about 22 inches [illegible]

[illegible]

[illegible] fertility, and low in organic-matter content. The response [illegible] pan restricts the depth to which roots can grow and limits [illegible] off is slow, and infiltration is slow.

This soil is suited to cotton, corn, soybeans, grain sorghum, [illegible] mudagrass, dallisgrass, johnsongrass, bahiagrass, tall fescue, [illegible] crimson clover, white clover, sudangrass, and truck crops.

Seedbed preparation and planting are sometimes delayed because this soil dries out slowly in spring. Graded rows [illegible] wet seasons. Fair to good yields of crops and pasture can be obtained.

If adequate drainage is established, this soil can be used for [illegible] cropping system consists of clean-tilled crops and close-growing [illegible] years of oats and 2 years of row crops. All crop residues should be shredded and left on the surface to reduce packing and thereby increase infiltration.

Yields of pasture and hay crops are good if fertilizer is applied. Pastures are easily damaged by trampling [illegible] winter and in the early part of spring because the soils stay wet and soft.

Capability unit IIw-3

This unit consists of nearly level, well-drained and moderately well drained soils on flood plains. These soils formed by wash from the loessal uplands. Both the surface layer and the subsoil are silt loam. The subsoil may be mottled with gray below a depth of 18 inches. The soils in this unit are—

[illegible]

These soils are moderate to high in natural fertility, low in organic-matter content, and medium acid to mildly alkaline. They have a thick root zone. The surface layer [illegible] to keep in good tilth and can be cultivated throughout a fairly wide range of moisture content without clodding. Movement of water through these soils is moderate, and the available moisture capacity is high.

These soils are some of the most productive in the county. They are well suited to cotton, corn, soybeans, [illegible] bermudagrass, tall fescue, dallisgrass, johnsongrass, [illegible] and white clover.

Occasional floods of fairly short duration are likely to cause moderate damage to crops. Removal of floodwater can be hastened by means of V-type and W-type ditches, field laterals, and graded rows. Yields are good if adequate drainage is established.

These soils can be used for clean-tilled crops continuously [illegible] tilled crops and close-growing crops in about equal [illegible] lowed by 2 years of row crops. Crop residues should be shredded and left on the surface to reduce crusting and packing and thereby increase infiltration.

Capability unit IIw-4

This unit consists of nearly level, somewhat poorly drained soils on the flood plains. These soils formed in loess and in local alluvium. The subsoil is silt loam. Mottling begins at a depth of about 7 inches. The soils in this unit are—

[illegible]

These soils are medium acid to mildly alkaline in reaction [illegible] organic-matter content. The surface layer is easy to keep [illegible] wide range of moisture content without clodding. Movement of water into and through these soils is moderate. The available moisture capacity is high.

[illegible] grass, Coastal bermudagrass, dallisgrass, tall fescue, bahiagrass, wild winter peas, vetch, annual lespedeza, and white clover.

Flooding and somewhat poor drainage are the [illegible]

graded rows help to remove surface water. Yields are good if adequate drainage is established.

These soils can be used for clean-tilled crops continuously. Another suitable cropping system consists of clean [illegible] crops. All crop residues should be shredded and left on the surface to reduce packing and thereby increase infiltration.

Yields of pasture and hay crops are good if fertilizer [illegible] in winter and in the early part of spring, when the soils are wet and soft.

Capability unit IIw-5

This unit consists of one nearly level, somewhat poorly drained soil that has a fragipan at a depth of about 20 [illegible] loess. The texture of the subsoil ranges from silt loam to silty clay loam. This soil is—

[illegible]

I[illegible] part of spring, this soil is likely to be waterlogged because water [illegible] likely to be droughty in dry summer weather because only a limited amount of moisture can be stored above the fragipan.

This soil is low in natural fertility, low in organic-matter content, and strongly acid. The response to fertilization is good. The root zone is restricted to the uppermost 2 feet, above the fragipan.

This soil is suited to cotton, soybeans, sorghum, small grain, Coastal bermudagrass, common bermudagrass, dallisgrass, bahiagrass, tall fescue, wild winter peas, vetch, annual lespedeza, and white clover.

Low fertility, wetness in winter and [illegible] of tillage is a problem because the soil is either too wet or [illegible] proved by means of V-type and W-type ditches, field laterals, and graded rows. Fair to good yields are obtained if this soil is adequately drained and fertilized.

This soil can be used for clean-tilled crops continuously. [illegible] sod and 2 years of row crops, for example, 4 years of [illegible] and left on the surface to reduce packing and thereby increase infiltration.

Yields of pasture and hay crops are good only if lime and fertilizer [illegible] damaged by trampling in winter and in the early part of spring, when the soil is wet and soft.

Capability unit IIIe-1

This unit consists of deep, well-drained, loessal soils on the uplands. The texture of the subsoil ranges from silt loam to silty clay loam. The slope range is 2 to 8 percent. The soils in this unit are—

[illegible]

These soils are suited to cotton, corn, soybeans, [illegible] grass, dallisgrass, johnsongrass, bahiagrass, tall fescue, [illegible]

These soils are moderately to severely eroded. Cropping [illegible] and slow down runoff provide some protection. If these soils are cultivated, vegetated waterways, graded [illegible] and terraces on the longer slopes help to reduce the loss of soil through erosion. Roads should be located on ridges parallel to terraces.

Close-growing crops should be grown about half of the [illegible] row crops followed by 2 years of small grain and lespedeza. Without adequate water control measures, these soils need a cropping system that consists of 2 years of sod for each year of row crops, for example, 4 years of sod and 2 years of row crops. Crop residues should be shredded and left on the surface to reduce packing and thereby increase infiltration.

Yields of pasture and hay crops are good if fertilizer is applied.

Capability unit IIIw-1

This unit consists of nearly level, moderately well drained to somewhat poorly drained, clayey soils on the Mississippi River flood plain. These soils formed in fine-textured sediments that lie over friable material. The surface layer is 4 to 6 inches thick. The upper part of the subsoil is clay, and the lower part is fine sandy loam to silt loam. Mottling begins at a depth of about 6 to 8 inches. The soils in this unit are—

[illegible]

These soils are slightly acid to mildly alkaline, high in [illegible] The surface layer is likely to be in poor tilth. Both the surface layer and the upper part of the subsoil are very sticky when wet, but they harden and crack when dry. Cultivation is feasible within only a narrow range of moisture content. Infiltration and the internal movement of water are slow in the surface layer and moderate to rapid in the lower layers.

These soils are suited to cotton, corn, soybeans, sorghum, small grain, bahiagrass, common bermudagrass, johnsongrass, sudangrass, tall fescue, dallisgrass, white clover, vetch, and wild winter peas.

These soils can be used for clean-tilled crops continuously. Another suitable cropping system consists of close-growing crops most of the time, for example, 4 years of sod and 2 years of row crops. Nitrogen is needed for all row crops and for all pasture crops except legumes. Crop residues should be shredded and left on the surface to increase infiltration. V-type and W-type ditches, field laterals, and graded rows help to remove surface water. Bedding, or crowning, improves drainage and aeration.

Capability unit IIIw-2

This capability unit consists of one nearly level, poorly drained, acid soil that has a fragipan at a depth of about 15 inches. The subsoil is mottled silt loam. This soil is—

[illegible] silt loam.

This soil is low in fertility and low in organic-matter content. Most of the time, the surface layer is either too wet or too dry to be tilled easily. The fragipan restricts the depth to which roots can grow and thereby greatly limits the amount of moisture available to plants. Unless this soil is drained, the subsoil is waterlogged and poorly aerated for long periods. Consequently, only a few crops can be grown.

This soil is suited to common bermudagrass, bahiagrass, fescue, white [illegible] lespedeza. [illegible] suited to some special truck crops.

Wetness in winter and spring, dryness in summer, and low fertility are [illegible] [illegible] [illegible] if this soil is adequately drained and fertilized.

This soil is best suited to close-growing crops. A [illegible] able cropping system, for example, consists of 4 years of sod and 2 years of sweetpotatoes. Crop residues should be shredded and left on the surface to reduce packing and thereby increase infiltration.

Yields of pasture and hay crops are good only if [illegible] [illegible] by trampling in winter and early in spring, when the soil is wet.

Capability unit IIIw-3

This unit consists of poorly drained soils in slack-water areas of the [illegible] face layer and the subsoil are clay. The soils in this unit are—

[illegible]
Sharkey [illegible]

These soils are strongly acid to mildly alkaline in reaction, high in natural fertility, and low in organic-matter content. The surface layer is likely to be in poor tilth. The surface layer and subsoil are very sticky when wet, but they harden and crack when they dry. Cultivation is feasible within only a narrow range of moisture content. Infiltration and the internal movement of water are slow.

These soils are suited to soybeans, oats, wheat, common bermudagrass, Coastal bermudagrass, dallisgrass, fescue, alfalfa, annual lespedeza, white clover, red clover, wild winter peas, and vetch.

V-type and W-type ditches, field laterals, and graded rows help to remove surface water. Bedding, or crowning, improves drainage and aeration.

These soils can be used for clean-tilled crops continuously. Another suitable cropping system is 4 years of sod and 2 years of row crops. Nitrogen is needed for all row crops and for all pasture crops except legumes. Crop residues should be shredded and left on the surface as a mulch between crops, to improve tilth and to increase infiltration. Seedbed preparation in fall is advisable to permit weathering and settling.

Capability unit IIIs-1

This unit consists of one somewhat excessively drained soil that formed in coarse-textured alluvium deposited by the Mississippi River. The texture of the surface layer ranges from fine sandy loam to loamy sand. The subsoil generally is loamy sand. This soil is—

[illegible] fine sandy loam.

This soil is moderately low in natural fertility, slightly acid to mildly alkaline in reaction, and low in organic-matter content. It is easy to keep in good tilth and can [illegible] content. The root zone is deep. Infiltration and the internal movement of water are rapid. The available moisture capacity is low.

This soil is suited to cotton, barley, oats, bahiagrass, [illegible]

[illegible] catches.

These soils can be used for clean-tilled crops continuously. Another suitable cropping system consists of clean [illegible] for example, 2 years of oats and vetch followed by 2 years of row crops. Crop residues should be shredded and left on the surface as a mulch. Nitrogen is needed for all row crops and for all pasture crops except legumes. For some crops, frequent small applications of a complete fertilizer are needed for maximum yields.

Pastures are seldom damaged by trampling in winter.

Capability unit IVe-1

This unit consists of deep, well-drained, strongly acid to moderately alkaline soils. The texture of the surface [illegible] ranges from [illegible] loam to silty clay loam. The one mapping unit is—

[illegible] percent slopes, [illegible] eroded.

These soils are moderate in natural fertility and low in organic-matter content. The root zone is thick. The surface layer is fairly easy to keep in good tilth. The movement of water is moderate. Enough water is available to meet the needs of most plants. Runoff is medium to rapid.

These soils are suited to cotton, corn, soybeans, grain sorghum, small grain, Coastal bermudagrass, common bermudagrass, dallisgrass, johnsongrass, bahiagrass, wild winter peas, vetch, annual and sericea lespedeza, [illegible] clover, white clover, and sudangrass.

Cropping systems and water control measures designed [illegible] against erosion. In cultivated areas, vegetated waterways and graded rows help to reduce the loss of soil through erosion. Terraces may be practical on the longer slopes. Roads should be located on ridges or parallel to terraces.

These soils need 2 years of close-growing crops for each year of row crops, for example, 4 years of small grain or pasture grasses and 2 years of corn. Without water control measures, they are best suited to perennial vegetation.

Crop residues should be shredded and left on the surface to help control erosion and to increase infiltration. Fertilizers are needed on all crops and on pasture.

Capability unit IVe-2

This unit consists of one moderately well drained loessal soil that has a strong fragipan at a depth of 16 to 32 inches. The fragipan is 24 or more inches thick. This soil is on the uplands. It is—

[illegible]

[illegible] fairly narrow range of moisture content without clodding or crusting. The response to lime and fertilizer is moderate. The root zone is limited by the fragipan. Infiltration is slow. Movement of water is moderate in the upper part of the subsoil and slow in the fragipan. Runoff is [illegible].

This soil is suited to cotton, corn, soybeans, [illegible] grain, small grain, Coastal bermudagrass, common bermudagrass, dallisgrass, johnsongrass, bahiagrass, wild winter peas, annual and sericea lespedeza, crimson clover, [illegible]

[illegible] limitations that have to be considered. Cropping systems [illegible] runoff provide some protection against erosion. A suitable cropping system consists of 3 years of close-growing crops for each year of row crops, for example, [illegible] of sod and 2 years of cotton. Tillage on the contour, sodded waterways, and terraces on the longer slopes are effective in controlling runoff and the loss of soil through [illegible]. Crop residues that are shredded and left on the surface increase infiltration and also help to control erosion. Fertilizers are needed on all crops and pasture.

Capability unit IVw-1

This unit consists of poorly drained and somewhat poorly drained soils that formed in silty material washed from the loessal uplands. The subsoil is silt loam and is mottled 6 to 18 inches below the surface. The one mapping unit is—

[illegible]

Natural fertility of these soils is moderate, their reaction is strongly acid, and their organic-matter content is low.

These soils are suited to hardwoods and pine, to summer pastures, and to an occasional late-season row crop.

Flooding and a seasonally high water table are the main limitations. The few small areas that have been cleared are now in trees again. If protected from floods, these soils can be used in the same way as those in capability unit IIIw-1.

Capability unit Vw-1

This unit consists of droughty to somewhat wet soils [illegible] surface layer and the subsoil ranges from silty clay loam to loamy sand. This mapping unit is—

Commerce, Robinsonville, and Crevasse soils.

The [illegible] tion, movement of water through the soils, and available moisture capacity are all variable.

[illegible] they are not suited to row crops or to pasture. They are [illegible] before other uses can be considered.

Capability unit Vw-2

[illegible] poorly drained, level and depressional soils that have a clayey subsoil. The soils in this unit are—

[illegible]

These soils are difficult to work and to manage. When dry, they shrink and crack enough to injure the roots of some plants. They are fertile, but their low position, poor drainage, and fine texture prevent plants from using fertilizer effectively. Reaction generally is mildly alkaline. Water moves into and through these soils very slowly. The available moisture capacity is high. Excess surface water often delays the planting of row crops.

These soils are mostly in forest. If drained, they are suited to rice, soybeans, and common bermudagrass. Some [illegible] be drained by means of V-type and W-type ditches. In some places large dragline ditches are needed for outlets. If row crops are grown, the row arrangement should provide maximum surface drainage.

Flooding makes permanent pasture hard to maintain. [illegible] for permanent pasture or hay. Another suitable cropping system consists of 2 years of rice followed by 2 years of sod.

Capability unit VIe-1

This unit consists of well-drained loessal soils on the uplands. The texture of the subsoil is silt loam or silty clay loam. These soils are eroded to the extent that the present surface layer consists largely of the upper part of the subsoil. The one mapping unit is—

[illegible] percent slopes, [illegible] eroded.

Natural fertility is moderate. The reaction ranges from [illegible] ter into the soils is slow, but the internal movement of [illegible]

These soils are suited to common bermudagrass, [illegible] They are not suited to row crops. They need to be kept in [illegible] infiltration, and control further erosion. Much of the acreage has been cropped in the past, but now most of it is in hardwoods.

A complete fertilizer generally is needed for pasture crops. The pastures should not be overgrazed. Woodlands should be protected from fire and from harmful grazing.

Capability unit VIIe-1

This unit consists of deep, well-drained, loessal soils on the uplands. Most areas have lost between 25 and 75 per-

cent of the original surface layer. Some small areas have most of the original surface layer, but others are eroded to the extent that the present surface layer consists largely of the upper part of the subsoil. The one mapping unit is:

Memphis and Natchez [illegible] percent slopes, eroded.

Natural fertility is moderate. The root zone is [illegible]. Movement of water into these soils is slow, but the internal movement of water is moderate. The available moisture capacity is high. Shallow gullies are fairly common, and deep ones once formed [illegible] a few places.

These soils are suited to common bermudagrass, [illegible] grass, annual and sericea lespedeza, and crimson clover. They are not suited to row crops. They need to be kept in perennial vegetation, which will reduce runoff, [illegible]. Much of the acreage has been cropped in the past, but now most of it is in hardwoods.

A complete fertilizer generally is needed for pasture crops. [illegible] should be protected from fire and from harmful grazing.

Capability unit VIIe-2

This unit consists of areas [illegible] which the soil is eroded into an intricate pattern of gullies. These gullies have cut [illegible] weathered loess [illegible]. Soil profiles have been destroyed, except in small areas between gullies. This mapping unit is—

Gullied land.

A well-managed permanent cover of trees is needed to stabilize these eroded areas.

Capability unit VIIw-1

This unit consists of low, wet areas that are flooded much of the time. The mapping unit is—

Swamp.

The soil material in these areas has not been classified. It generally consists of a mixture of sediments deposited by floodwaters and overflowing streams. Ordinarily, the surface layer is dark colored and acid and 4 to 12 inches thick. The underlying material is variable in both color and texture and ranges in reaction from strongly acid to moderately alkaline. Because they are poorly drained and frequently flooded, these soils are best suited to woodland and wildlife.

Capability unit VIIIs-1

This unit consists of moderately sloping to very steep areas where cuts and fills have been made for building sites. The land types in this unit are—

Made land, sloping.
Made land, steep.

The reaction ranges from strongly acid to moderately alkaline. [illegible] is fairly slow, but the internal movement of water is moderate. The available moisture capacity is high.

These areas are used chiefly for building sites, parks, and playgrounds. They are suited to a wide variety of shade trees, ornamental trees, shrubs, vines, turf grasses, and annual plants. Tests should be made before landscaping to determine the need for lime, as some areas need lime and others do not.

Estimated Yields

The soils of Warren County vary considerably in productivity. Some consistently produce high yields of cultivated crops, and others are better suited to less intensive use.

Estimates of yields of the principal crops, under two levels of [illegible]. Estimates of yields of pasture and hay, at high and low levels of liming and fertilization, are shown in table 4. For cultivated crops, separate estimates are given for the loess hills and for the Mississippi alluvial plain, because the soils of the two areas differ in fertility and in management requirements. The estimates are averages for a long period of time. In any given year, the yield of any crop may be more or less than the figure shown.

The estimates are based on data obtained by long-term experiments, [illegible] cooperative soil productivity-management studies, [illegible] had [illegible] experience with crops in Warren County.

The figures in the "A" columns are estimates of yields [illegible]. The "B" columns are estimates of yields under improved management but are not presumed to represent the maximum [illegible].

General management practices assumed for yields in "B" columns of tables 2 and 3:

1. Fertilizer applied according to the needs indicated by chemical tests and by past cropping and fertilizer practices.
2. Use of high-yielding varieties that are suited to the area.
3. Adequate seedbed preparation.
4. Planting or seeding by suitable methods, at suitable rates, and at the right time.
5. Inoculation of legume seed.
6. Shallow cultivation of row crops.
7. Control of weeds, insects, and diseases.
8. Use of soil-conserving cropping systems, such as are suggested in the section on capability units.
9. Water management where needed, sodding of waterways, cultivating on the contour, terracing, and stripcropping.
10. Good management of crop residues.

Specific management practices, by crops, under which yields shown in table 2 were obtained on the soils of the loess hills, are shown as follows:

Cotton.—For cotton, practices at the two levels of management are—

Level A: 30 to 60 pounds of nitrogen and 30 to 40 pounds each of phosphate and potash per acre.

Level B: 60 to 90 pounds of nitrogen and 48 to 60 pounds each of phosphate and potash per acre.

Corn.—For corn, practices at the two levels of management are—

Level A: 45 to 65 pounds of nitrogen and 30 to 35 pounds each of phosphate and potash per acre. 8,000 to 10,000 plants per acre.

Level B.—90 to 120 pounds of nitrogen and 40 to 60 pounds each of phosphate and potash per acre; 10,000 to 12,000 plants per acre.

Oats.—For oats, practices at the two levels of management are—

Level A.—45 to 60 pounds of nitrogen and 20 to 35 pounds each of phosphate and potash per acre.

Level B.—90 to 120 pounds of nitrogen and 45 to 60 pounds each of phosphate and potash per acre.

Soybeans.—For soybeans, practices at the two levels of management are—

Level A.—40 to 50 pounds of phosphate and 20 to 25 pounds of potash at planting time; inoculation of seed.

Level B.—60 pounds of phosphate and 30 pounds of potash at planting time; inoculation of seed.

Specific management practices, by crops, under which yields shown in table 3 were obtained on soils of the Mississippi alluvial plain, are listed as follows:

Cotton.—Generally cotton is grown under a medium to high level of management.

Level A.—One or more improved management practices, but not all of those used at the B level.

Level B.—All improved practices applied. Approximately 100 to 110 pounds of nitrogen per acre.

Corn.—For corn, practices at the two levels of management are—

Level A.—33 to 90 pounds of nitrogen per acre; 8,000 to 10,000 plants per acre.

Level B.—90 to 120 pounds of nitrogen per acre; 10,000 to 12,000 plants per acre.

Oats.—For oats, practices at the two levels of management are—

Level A.—A single application of 45 pounds of nitrogen.

Level B.—20 to 30 pounds of nitrogen at planting time; topdressing of 65 pounds of nitrogen between March 1 and March 15.

Soybeans.—Soybeans generally are not fertilized. Yields differ less from one soil to another than yields of other crops. Soybeans are vulnerable to climatic conditions, and yields are inconsistent.

Level A.—Practices below optimum.

Level B.—Planting at proper time; inoculation of seed at planting time; shallow cultivation for control of weeds.

TABLE 2.—*Estimated average acre yields of the principal crops on the soils of the loess hills under two levels of management*

[Yields in columns A are those obtained under common management practices; those in columns B are yields to be expected under improved management. Absence of figure indicates crop is not commonly grown]

Soil	Cotton A	Cotton B	Corn A	Corn B	Oats A	Oats B	Soybeans A	Soybeans B
	Lb.	Lb.	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.
Adler silt loam	500	800	60	100	40	80	18	25
Adler and Morganfield silt loams, local alluvium	500	800	60	100	40	80	18	25
Calloway silt loam			30	50	30	60	15	25
Collins silt loam	500	800	60	100	40	80	18	25
Collins silt loam, local alluvium	500	800	60	100	40	80	18	25
Falaya silt loam	425	675	55	90	35	75	18	25
Falaya silt loam, local alluvium	425	675	55	90	35	75	18	25
Grenada silt loam, 0 to 2 percent slopes	450	700	65	85	40	80	18	25
Grenada silt loam, 2 to 5 percent slopes	450	700	65	85	40	80	15	25
Grenada silt loam, 2 to 5 percent slopes, eroded	425	650	50	75	40	80	15	25
Grenada silt loam, 5 to 8 percent slopes, severely eroded	400	625	35	65	35	65		25
Gullied land								
Henry silt loam								
Memphis silt loam, 0 to 2 percent slopes	475	750	60	90	40	80	18	25
Memphis silt loam, 2 to 5 percent slopes	475	750	60	90	40	80	18	25
Memphis silt loam, 2 to 5 percent slopes, eroded	450	750	55	85	40	80	15	20
Memphis silt loam, 2 to 5 percent slopes, severely eroded	425	700	50	80	40	80	15	25
Memphis silt loam, 5 to 8 percent slopes, eroded	425	700	50	80	40	80	15	25
Memphis silt loam, 5 to 8 percent slopes, severely eroded	400	675	45	75	35	75		
Memphis and Loring silt loams, 0 to 2 percent slopes	475	750	60	90	40	80	18	25
Memphis and Loring silt loams, 2 to 5 percent slopes	475	750	60	90	40	80	18	25
Memphis and Loring silt loams, 2 to 5 percent slopes, eroded	450	750	55	85	40	80	18	25
Memphis and Loring silt loams, 2 to 5 percent slopes, severely eroded	425	700	50	80	35	70	18	25
Memphis and Loring silt loams, 5 to 8 percent slopes, eroded	425	700	50	80	35	70	15	25
Memphis and Loring silt loams, 5 to 8 percent slopes, severely eroded	400	675	45	75	35	65		
Memphis and Natchez silt loams, 8 to 12 percent slopes, severely eroded	400	675	40	70	35	65		
Memphis and Natchez silt loams, 12 to 17 percent slopes, severely eroded								
Memphis and Natchez silt loams, 17 to 40 percent slopes, eroded								
Morganfield silt loam	500	800	60	100	40	80	18	25
Silty land, rolling								
Silty land, steep								
Wakeland silt loam	425	675	55	90	35	75	20	25
Wakeland silt loam, local alluvium	425	675	55	90	35	75	20	25
Waverly and Falaya silt loams								

TABLE 3.—*Estimated average acre yields of the principal crops on the soils of the Mississippi River alluvial plain under two levels of management*

[Yields in columns A are those obtained under common management; those in columns B are yields to be expected under improved management. Absence of figure indicates crop is not commonly grown]

Soil	Cotton lint A	Cotton lint B	Corn A	Corn B	Oats A	Oats B	Soybeans A	Soybeans B
	Lb.	Lb.	Bu.	Bu.	Bu.	Bu.	Bu.	Bu.
Alligator clay	475	525			55	90	22	27
Bowdre silty clay	600	725					27	33
Commerce silt loam	725	850	60	80	55	90	22	28
Commerce silty clay loam	600	825	60	80	40	80	22	28
Commerce very fine sandy loam	725	850	60	80	55	90	22	28
Commerce, Robinsonville, and Crevasse soils								
Crevasse fine sandy loam	[illegible]	550						
Dowling clay								
Robinsonville loam	600	[illegible]	60	80	[illegible]	[illegible]		
Sharkey clay	[illegible]	525			55	90	[illegible]	27
Sharkey, Tunica, and Dowling clays								
Swamp								
Tunica silty clay		650			55	90	25	33

Estimated yields of the principal forage crops at high and low levels of liming and fertilization are given in table 4. The figures are based on yields obtained in long-term experiments and on estimates by agronomists and other agricultural workers who have had experience with forage crops and soils in Warren County.

All estimates are for yields from soils that have not been irrigated; they are based on average rainfall.

The soils are placed in nine groups. Each group consists of soils that are similar in productivity for given plant mixtures and in requirements for conservation practices and other management.

The annual fertilization is the amount of fertilizer necessary for each group of plants if the yields given in the last two columns are to be obtained. It is not a recommendation. The pH values are given according to the fertilizer levels.

Yields for pasture are given in animal-unit-months. An animal-unit-month is a month's grazing for one animal unit without injury to the pasture. An animal unit is one 1,200-pound cow, two 600-pound yearlings, five ewes with lambs, five sows with litters to weaning age, twenty 50- to 150-pound pigs, one horse, or one mule.

Yields are given in tons of air-dried hay.

These data are useful in developing balanced grazing plans and in calculating safe stocking rates for pastures.

Figure 3.—Weeds, brush, shrubs, and forest trees on abandoned field of Memphis and Natchez silt loams, 8 to 12 percent slopes, severely eroded.

Woodland[1]

Forest originally covered all of Warren County. For the most part, the loessal hills were covered with hardwoods, but some pine also grew in the eastern part of the county. As the hardwoods were [illegible] [illegible], pine became more abundant.

The alluvial land along streams was heavily forested with sweetgum, oaks of various species, elm, hackberry, pecan, water hickory, ash, persimmon, cottonwood, sycamore, willow, tupelo, and cypress. [illegible] 1925, most farms in the county contained woodlots. Many fields that had been cultivated reverted to weeds, brush, shrubs, and forest trees (fig. 3).

About two-thirds of the county is still woodland, but the species and distribution have changed. Most of the choice virgin timber has been logged, and areas have been cleared for crops and pasture. The woodland now is largely second growth. Many of the trees are small and of poor quality (fig. 3), but in some well-managed forests, trees are growing rapidly and the second-growth stands are potentially of high quality (fig. 4).

Lumbering began when the county was settled. It was an important industry by 1900, at which time approximately 80 percent of the county was forested. It increased during World War I. Hardwoods of good quality were harvested, particularly ash, oak, magnolia, poplar, sweetgum, and tupelo.

Large amounts of hardwood and pine were harvested during and after World War II. From 1942 through 1950, portable (woodpecker) sawmills were moved from place to place. Loggers cut almost all of the remaining virgin timber and much of the second-growth timber that had grown to merchantable size.

[1] This section was prepared cooperatively by W. A. [illegible], Soil Conservation Service, and W. M. [illegible], United States Forest Service.

TABLE 4.—*Estimated average acre yields of pasture and hay, by groups of soils, at high and low levels of liming and fertilization*

[N stands for elemental nitrogen; P for phosphate, P_2O_5; K for potash (K_2O). Absence of figure indicates soils are not commonly used for crop]

Soils	Plants for pasture or hay	Level	Annual fertilization (Pounds per acre)	pH brought to	Yields: Pasture (Animal-unit-months)	Yields: Hay (Tons)
Group 1 Grenada silt loam, 0 to 2 percent slopes. Grenada silt loam, 2 to 5 percent slopes. Grenada silt loam, 2 to 5 percent slopes, eroded. Memphis silt loam, 0 to 2 percent slopes. Memphis silt loam, 2 to 5 percent slopes. Memphis silt loam, 2 to 5 percent slopes, eroded. Memphis silt loam, 5 to 8 percent slopes, eroded. Memphis and Loring silt loams, 0 to 2 percent slopes. Memphis and Loring silt loams, 2 to 5 percent slopes. Memphis and Loring silt loams, 2 to 5 percent slopes, eroded. Memphis and Loring silt loams, 5 to 8 percent slopes, eroded.	Bahiagrass or common bermudagrass mixed with crimson clover, annual lespedeza, white clover, vetch, or wild winter peas.	High	N, 60; P, 60; K, 60	6.0	[illegible]	[illegible]
		Low	N, 20; P, 0; K, 10	5.4	5.[illegible]	[illegible]
	Coastal bermudagrass mixed with crimson clover, annual lespedeza, white clover, vetch, or wild winter peas.	High	N, 100; P, 90; K, 90	6.0	[illegible]	[illegible]
		Low	N, 30; P, 0; K, 0	5.2	8.0	[illegible]
	Oats, wheat, and ryegrass	High	N, 50; P, 90; K, 90	6.0		[illegible]
		Low	N, 30; P, 30; K, [illegible]	5.4	4.0	
	Millet or sudangrass	High	N, 70; P, 60; K, 50	6.0	7.0	3.0
		Low	N, 30; P, 30; K, 10	5.4	3.0	[illegible]
Group 2 Grenada silt loam, 5 to 8 percent slopes, severely eroded. Memphis silt loam, 2 to 5 percent slopes, severely eroded. Memphis silt loam, 5 to 8 percent slopes, severely eroded. Memphis and Loring silt loams, 2 to 5 percent slopes, severely eroded. Memphis and Loring silt loams, 5 to 8 percent slopes, severely eroded. Memphis and Natchez silt loams, 8 to 12 percent slopes, severely eroded. Memphis and Natchez silt loams, 12 to [illegible] percent slopes, severely eroded.	Bahiagrass or common bermudagrass with crimson clover, lespedeza, or vetch.	High	N, 60; P, 60; K, 60	6.[illegible]	8.0	2.4
		Low	N, 20; P, 0; K, 10	5.4	[illegible]	1.[illegible]
	Sericea lespedeza	High	N, 0; P, 90; K, 40	6.0	5.6	2.2
		Low	N, 0; P, 30; K, [illegible]	5.4	3.3	1.1
	Oats, wheat, and ryegrass	High	N, 50; P, 90; K, 90	6.0	6.4	2.[illegible]
		Low	N, 30; P, 30; K, [illegible]	5.4	3.2	1.0
	Millet or sudangrass	High	N, 90; P, 60; K, 50	6.0	6.7	
		Low	N, 30; P, 30; K, 10	5.4	[illegible]	
Group 3 Calloway silt loam. Henry silt loam.	Bahiagrass with vetch, wild winter peas, or white clover.	High	N, 100; P, 60; K, 60	6.0	8.3	[illegible]
		Low	N, 20; P, 20; K, [illegible]	5.4	5	[illegible]
	Tall fescue with vetch, wild winter peas, or white clover.	High	N, 100; P, 90; K, 90	6.[illegible]	6.7	2.[illegible]
		Low	N, 20; P, 20; K, [illegible]	5.4	3.4	[illegible]
	Common bermudagrass or bahiagrass with vetch, wild winter peas, or white clover.	High	N, 100; P, 60; K, 60	6.0	8.0	2.4
		Low	N, 20; P, 20; K, 10	5.4	4.0	1.3
	Oats, wheat, and ryegrass	High	N, 50; P, 90; K, 60	6.0	6.6	2.[illegible]
		Low	N, 30; P, 30; K, [illegible]	5.4	3.0	[illegible]
Group 4 Adler silt loam. Adler and Morganfield silt loams, local alluvium.[2] Collins silt loam. Collins silt loam, local alluvium. Falaya silt loam. Falaya silt loam, local alluvium. Morganfield silt loam. Wakeland silt loam.[2] Wakeland silt loam, local alluvium.[2]	Common bermudagrass or bahiagrass with white clover, wild winter peas, or vetch.	High	N, 100; P, 60; K, 60	6.0	[illegible]	3.2
		Low	N, 20; P, 20; K, 10	5.3	[illegible]	2.1
	Dallisgrass with white clover, wild winter peas, or vetch.	High	N, 100; P, 60; K, 60	6.5	[illegible]	3.3
		Low	N, 20; P, [illegible]; K, 10	5.[illegible]	7.5	2.2
	Oats, wheat, and ryegrass	High	N, 50; P, 90; K, 90	6.5	[illegible]	3.[illegible]
		Low	N, 30; P, 30; K, 10	5.[illegible]	3.2	[illegible]
	Tall fescue with white clover, wild winter peas, or vetch.	High	N, 150; P, 90; K, 90	6.5	9.6	2.9
		Low	N, 30; P, 30; K, [illegible]	5.7	4.0	[illegible]
Group 5 Waverly and Falaya silt loams.	Dallisgrass with white clover or wild winter peas.	High	N, 100; P, 60; K, 60	6.1	[illegible]	3.0
		Low	N, 20; P, [illegible]; K, [illegible]	5.5	7.5	2.2
	Fescue with white clover or wild winter peas.	High	N, 150; P, 90; K, 60	6.[illegible]	9.3	2.6
		Low	N, 30; P, 30; K, [illegible]	5.5	6.3	[illegible]

See footnotes at end of table.

TABLE 4.—*Estimated average acre yields of pasture and hay, by groups of soils, at high and low levels of liming and fertilization*—Continued

[N stands for elemental nitrogen, P for phosphate (P_2O_5), K for potash (K_2O). Absence of figures indicates soils are not commonly used for crop]

Soils	Plants for pasture or hay	Annual fertilization		pH brought to—	Yields: Pasture	Yields: Hay
			Pounds per acre		*Animal-unit-months*[1]	*Tons*
Group 6: Alligator clay. Bowdre silty clay. Dowling clay. Sharkey clay. Sharkey, Tunica, and Dowling clays. Tunica silty clay.	Tall fescue with white clover.	High	N 120, P 0, K 0	[3]	2.0	
		Low	N 30, P 0, K 0	[3]	9.9	
	Coastal bermudagrass with wild winter peas.	High	N 20, P 0, K 0	[3]	5.0	[illegible]
		Low	N 30, P 0, K 0	[3]	[illegible]	[illegible]
	Common bermudagrass with wild winter peas.	High	N 20, P 0, K 0	[3]	0.6	6.0
		Low	N 30, P 0, K 0	[3]	5	5.0
	Johnsongrass with red clover.	High	N 20, P 0, K 0	[3]	12.0	[illegible]
		Low	N 30, P 0, K 0	[3]	7.6	4.5
Group 7: Commerce silt loam. Commerce silty clay loam. Commerce very fine sandy loam. Commerce, Robinsonville, and Crevasse soils. Robinsonville loam.	Coastal bermudagrass and wild winter peas.	High	N 20, P 0, K 0	[3]	16.1	8.0
		Low	N 30, P 0, K 0	[3]	12.6	4.0
	Common bermudagrass and wild winter peas.	High	N 20, P 0, K 0	[3]	[illegible]	0.0
		Low	N 30, P 0, K 0	[3]	8.1	3.0
	Tall fescue and white clover.	High	N 20, P 0, K 0	[3]	6	
		Low	N 30, P 0, K 0	[3]	9	
	Johnsongrass and white clover.	High	N 20, P 0, K 0	[3]	3.2	0
		Low	N 30, P 0, K 0	[3]	7.5	4.5
	Wheat, oats, and ryegrass.	High	N 120, P 0, K 0	[3]	9.5	
		Low	N 30, P 0, K 0	[3]	4.4	
Group 8: Crevasse fine sandy loam.	Coastal bermudagrass and wild winter peas.	High	N 120, P 0, K 0	[3]	5.5	6.0
		Low	N 30, P 0, K 0	[3]	10.2	4.0
	Common bermudagrass and wild winter peas.	High	N 120, P 0, K 0	[3]	10.7	4.0
		Low	N 30, P 0, K 0	[3]	7.8	2.5
	Johnsongrass and crimson clover.	High	N 20, P 0, K 0	[3]	[illegible]	6.0
		Low	N 30, P 0, K 0	[3]	7.5	4.0
	Ryegrass	High	N 20, P 0, K 0	[3]	8.0	
		Low	N 30, P 0, K 0	[3]	3.4	
Group 9: Gullied land. Memphis and Natchez silt loams, 17 to 40 percent slopes, eroded. Silty land, rolling. Silty land, steep. Swamp.	[4]					

[1] An animal-unit-month is a month's grazing for one animal without injury to the pasture. An animal unit is one 1,000-pound cow, two 500-pound yearlings, five ewes with lambs, five sows with litters to weaning age, twenty 50- to 150-pound pigs, one horse, or one mule.
[2] If pH above 6, needs no adjustment.
[3] Needs no adjustment.
[4] These soils were not used for pasture or hay because of (1) severe erosion hazard, (2) unfavorable moisture relationships, (3) difficulty in management, (4) use primarily for urban development, or (5) extreme wetness.

Several lumber processing plants operate in Warren County. These include three sawmills, one veneer plant, and one cooperage plant. There are a number of smaller sawmills and several other small wood-processing plants. Although no pulp-using industry is located within the county, at least three large plants draw heavily on the supply of pulpwood.

Woodland suitability groups of soils

Management of woodland can be planned more effectively if soils are grouped according to those characteristics that affect the growth of trees and management of the stands. For this reason, the soils of Warren County have been placed in 12 woodland suitability groups. Each group consists of soils that have about the same suitability for wood crops, require about the same management, and have about the same potential productivity. Silty land, rolling, and Silty land, steep, which are obviously unsuitable for woodland, are not included in any of the groups.

The potential productivity of a soil for a specified kind of tree is expressed as *site index*. A site index is the average height that the dominant and co-dominant trees, except cottonwood, will attain in 50 years. It depends mainly on the capacity of the soil to supply moisture and to provide growing space for tree roots. For cottonwood, the site index is the average height trees will attain in 30 years. Each of the 12 groups is discussed in this section, and information on productivity and management is summarized in table 5.

Table 5 gives the range in site index for all of the soils in each suitability group, for the particular species that normally occur on the soils of each group.

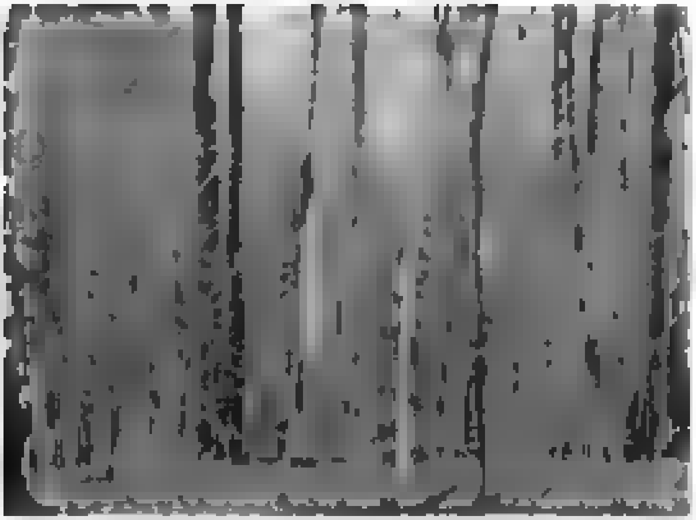

Figure 3.—Small trees of poor quality and undesirable species on Memphis and Loring silt loams, 2 to 5 percent slopes.

Figure 4.—An excellent stand of second-growth yellow-poplar, sawtimber size, on Memphis silt loam, 5 to 8 percent slopes.

The soils of each group have, in varying degrees, limitations that affect management. These are [illegible] competition, equipment limitation, seedling mortality, windthrow hazard, and erosion hazard, each rated as *slight*, [illegible]

[illegible] fire, cutting, grazing, or other operations, may be invaded by brush and undesirable trees and plants. Competition from the invading vegetation hinders the establishment and growth of desirable trees.

Competition is *slight* if unwanted plants are no special problem. It is *moderate* if the invaders delay but do not prevent the establishment of a normal, fully stocked stand [illegible] preparation of the site and management that includes controlled burning, spraying with chemicals, and girdling.

Equipment Limitation.—Drainage, slope, soil texture, or other soil characteristics may restrict or prohibit the use of ordinary equipment in pruning, thinning, harvesting, or other woodland management operations. Different soils may require different kinds of equipment, different methods of operation, or may be restricted at different seasons.

The limitation is *slight* if there are no restrictions on the type of equipment at any time of the year. It is *moderate* if slopes are moderately steep, if heavy equipment is [illegible] use of equipment damages the tree roots to some extent. [illegible] severely damages the tree roots and causes serious damage to the structure and stability of the soil. The use of equipment is severely limited on wet bottom lands and low terraces in winter or early in spring.

Seedling Mortality.—Even when healthy seedlings of suitable species are correctly planted or occur naturally in adequate numbers, some seedlings fail to survive if characteristics of the soil are unfavorable.

[illegible] planted seedlings die, or if trees ordinarily regenerate [illegible] *moderate* if 25 to 50 percent of planted seedlings die, or if trees do not regenerate [illegible] for adequate restocking. In some places replanting to fill [illegible] 50 percent of the planted seedlings die or if trees do not [illegible] enough seeds, special methods of planting are necessary for adequate restocking, and some replanting will probably be needed.

Windthrow Hazard.—Soil characteristics affect the development of tree roots and the resistance of the trees to the force of the wind. Root development may be prevented by a high water table or by an impermeable layer. The protection of surrounding trees also affects windthrow hazard. [illegible]

The windthrow hazard is *slight* if roots hold the tree firmly against a normal wind and individual trees are likely to remain standing even if protective trees on all sides are removed. The hazard is *moderate* if the roots develop enough to hold the tree firmly except when the soil

is excessively wet and the wind velocity is very high. It is *severe* if rooting is not deep enough to [illegible] [illegible] if they are released on all sides.

Erosion Hazard.—[illegible] from erosion by adjusting the rotation age and cutting cycles, [illegible] fully constructing and maintaining roads, trails, and landings. The erosion hazard is rated according to the risk of [illegible] well-managed wood and that is not protected by special practices.

The hazard is *slight* in places where a small loss of soil is likely, generally where the slope range is 0 to 2 percent [illegible] in places where the loss of soil is likely to be moderate if runoff is not controlled and the vegetation is not adequate for protection. It is *severe* in places where steep slopes [illegible] make the soil highly susceptible to erosion.

WOODLAND SUITABILITY GROUP [illegible]

This group consists of silty soils that formed in alluvium washed from the loess hills. These soils are predominantly somewhat poorly drained and moderately well drained, but in some small areas they are well drained. The texture of both the surface layer and the subsoil ranges from silt loam to silty clay loam. Permeability is moderate to slow, and the water-holding capacity is high. The reaction is slightly acid to mildly alkaline. The soils in this group are—

[illegible]

Pine does not grow naturally on these soils. Some of the most important suitable hardwoods are eastern cottonwood, cherrybark oak, Shumard oak, water oak, white oak, willow oak, sweetgum, American sycamore, and yellow-poplar.

In places plant competition delays the natural regeneration of trees and slows initial growth, but it does not prevent desirable species from becoming established.

Seedling mortality is generally slight where the light is adequate and flooding is not too severe.

The windthrow hazard is not serious. Individual trees can be expected to remain standing when released on all sides.

The use of equipment may be restricted for periods of 1 to 3 months.

WOODLAND SUITABILITY GROUP [illegible]

This group consists of level and nearly level, fine-textured soils on the Mississippi alluvial plain. The surface layer is clay or silty clay. The subsoil ordinarily is clay. [illegible] 24 inches below the surface. Water stands on or near the surface much of the time. Internal drainage is very slow to slow. Permeability is very slow. The available moisture capacity is high. The soils in this group are—

[illegible]

Pine does not grow naturally on these soils. Some of the suitable hardwoods are willow oak, sweetgum, cottonwood, cherrybark oak, hackberry, Nuttall oak, overcup oak, water oak, and common persimmon. The level areas are the best sites for cottonwood, Nuttall oak, and overcup oak. The slopes and ridges are best for the other oaks and for sweetgum.

Plant competition is moderate to severe, depending upon [illegible] moderate competition delays natural regeneration and slows initial growth, but it does not prevent an adequate stand of desirable species from becoming established. Where competition is severe, it can be controlled by burning, applying chemical sprays, clearing, disking, and other [illegible].

Seedling mortality generally is slight where the light is adequate and flooding is not too severe. The loss of planted stock is less than 25 percent.

Windthrow is not a serious hazard. Individual trees can be expected to remain standing, even when released on all sides.

The use of equipment is restricted for periods of 3 to 6 months or more by wetness or flooding.

WOODLAND SUITABILITY GROUP [illegible]

This group consists of nearly level, moderately well [illegible] the Mississippi River alluvial plain. The upper part of the profile, [illegible] lower part ranges from silt loam to loamy sand in texture. Permeability is slow in the upper part and moderate to rapid in the lower part. The available moisture capacity is moderate to high. The soils in this group are—

[illegible]

Pine does not grow naturally on these soils. Some of the suitable hardwoods are eastern cottonwood, hackberry, red maple, cherrybark oak, Nuttall oak, water oak, willow oak, and sweetgum.

Plant competition is moderate to severe, depending upon [illegible] moderate competition delays natural regeneration and slows the initial growth of trees, but it does not prevent establishment of an adequate stand of desirable species. Where competition is severe, it can be controlled by burning, applying chemical sprays, clearing, disking, and other [illegible].

Seedling mortality generally is slight where the light is [illegible] planted stock generally is less than 25 percent.

Windthrow is not a serious hazard on these soils. Individual trees can be expected to remain standing, even when released on all sides.

The use of equipment is restricted for periods of 1 to 6 months or more by wetness or flooding.

WOODLAND SUITABILITY GROUP [illegible]

This group consists of nearly level to moderately sloping [illegible] soils that have a strong fragipan. These soils formed in loess. In areas that are not eroded, the surface layer is silt loam and the subsoil is silty clay loam. The fragipan is

TABLE 5.—*Productivity, hazards, and*

[illegible] indicate that

Woodland group, description of soils, and map symbols		Potential productivity		
		Species	Site index	Annual growing stock [1]
				Board feet per acre (Doyle rule)
Group [illegible]	Moderately well drained to somewhat poorly drained, mildly alkaline soils formed in alluvium washed from the loess hills (Ad, Am, M[illegible], Wa, Wo).	Sweetgum	95 to 109	495 to 583
		Cottonwood	100 to [illegible]19	550 to 776
		Cherrybark oak	95 to [illegible]4	4[illegible]3 to 510
Group 2	Fine-textured, very slowly permeable soils on the Mississippi River alluvial plain (Ar, Sc, Sd).	Willow oak	85 to 94	357 to 408
		Sweetgum	85 to 94	430 to 490
		Cottonwood	90 to 99	470 to 642
		Cherrybark oak	80 to 99	325 to 4[illegible]3
Group 3	Nearly level, moderately well drained and somewhat poorly drained soils on the Mississippi River alluvial plain (Bo, Tu).	Willow oak	85 to 94	357 to 408
		Sweetgum	85 to 99	430 to 5[illegible]5
		Cottonwood	95 to 1[illegible]	510 to 698
		Cherrybark oak	85 to 104	357 to 457
Group 4	Nearly level to moderately sloping, somewhat poorly drained to moderately well drained soils that have a strong fragipan (Ca, GrA, GrB, GrB2, GrC3).	Loblolly pine	78 to 88	2[illegible]0 to 290
		Shortleaf pine	70 to 7[illegible]	[illegible]73 to 222
		Sweetgum	80 to 89	380 to 462
		Cherrybark oak	80 to 94	325 to 408
Group 5	Moderately well drained, acid soils formed in alluvium washed from the loess hills (C[illegible], Cm).	Loblolly pine	89 to [illegible]7	320 to 5[illegible]5
		Sweetgum	05 to [illegible]1	[illegible]55 to 618
		Cottonwood	[illegible]5 to [illegible]24	[illegible] to 836
		Cherrybark oak	100 to 119	435 to 535
Group 6	Somewhat poorly drained, acid soils formed in alluvium washed from the loess hills (Fa, Fl).	Loblolly pine	90 to 1[illegible]0	380 to 500
		Sweetgum	95 to 104	405 to 548
		Cottonwood	95 to 109	510 to 631
		Cherrybark oak	90 to [illegible]04	390 to 457
Group [illegible]	Medium-textured, somewhat poorly drained to well-drained soils on the Mississippi River alluvial plain (Cn, Co, Cp, Cr, Ra).	Sweetgum	95 to [illegible]09	495 to 583
		Cottonwood	100 to [illegible]24	550 to 836
		Cherrybark oak	95 to [illegible]4	4[illegible]3 to 5[illegible]
Group 8	Coarse-textured, sandy soils of the Mississippi River alluvial plain (Cy).	Sweetgum	90 to 99	470 to 5[illegible]5
		Cottonwood	100 to 1[illegible]9	550 to 766
		Cherrybark oak	[illegible] to [illegible]04	413 to 457
Group 9	Fine textured and moderately fine textured, very poorly drained soils on first bottoms and in depressions and former channels (Do, Sw, Wf).			
Group [illegible]0	Strongly sloping to steep, eroded soils on the loess hills, eroded to gullied (Gu, MnD3, MnE3).	Loblolly pine	[illegible]	[illegible]
		Shortleaf pine		
	Steep eroded soils, the slope range is 1[illegible] to 40 percent (MnF2).	Sweetgum	95 to 104	495 to 548
		Cottonwood	100 to 119	550 to 766
		Cherrybark oak	105 to [illegible]14	463 to 5[illegible]
Group [illegible]	Poorly drained, loessal soils in nearly level or depressed areas; strong fragipan (Hn).	Loblolly pine	6[illegible] to 09	240 to 447
		Sweetgum	70 to 79	33[illegible] to 384
		Cherrybark oak	75 to 84	293 to 351
Group [illegible]2	Nearly level to moderately sloping, well-drained loessal soils (MeA, MeB, MeB2, MeB3, MeC2, MeC3, MlA, MlB, MlB2, MlB3, MlC2, MlC3).	Loblolly pine	[illegible] to [illegible]06	320 to 625
		Shortleaf pine	57 to [illegible]4	[illegible]
		Sweetgum	90 to [illegible]04	470 to 548
		Cherrybark oak	100 to 109	435 to 486

[1] Pine site indexes include estimates from nearby counties. Hardwood site indexes estimated on basis of information in publications (2, 3, 4, 5) listed in Literature Cited, page 70. Cottonwood site index is based on height at 30 years; others on height at 50 years. [illegible] are not applicable to hardwoods on eroded soils.

management for woodland suitability groups

data is not available]

Commercially suited species	Hazards and management
Eastern cottonwood, cherrybark oak, Shumard oak, water oak, white oak, willow oak, sweetgum, American sycamore, yellow-poplar	Plant competition moderate; removal of unwanted trees and shrubs may be necessary. Equipment limitation moderate; use restricted for a period of 1 to 3 months by flooding.
Willow oak, sweetgum, cottonwood, cherrybark oak, hackberry, Nuttall oak, overcup oak, water oak, common persimmon	Plant competition moderate to severe; in some areas it is necessary to remove unwanted plants. Equipment limitation severe; use restricted for a period of 3 to 6 months by wetness.
Eastern cottonwood, hackberry, red maple, cherrybark oak, Nuttall oak, water oak, willow oak, sweetgum.	Plant competition moderate to severe; [illegible] methods of seedbed preparation help to restock desirable species. Equipment limitation moderate to severe; use restricted for a period of 1 to 6 months by wetness.
Eroded areas: Loblolly pine, shortleaf pine. Noneroded areas: Cherrybark oak, Shumard oak, water oak, white oak, sweetgum	Plant competition moderate; in places delays natural regeneration and slows initial growth. Windthrow hazard slight to moderate because of the fragipan. Erosion hazard generally slight in forested areas because of mild slopes. Equipment limitation slight
Loblolly pine, eastern cottonwood, southern magnolia, cherrybark oak, Shumard oak, swamp chestnut oak, water oak, white oak, willow oak, sweetgum, American sycamore, black tupelo, yellow-poplar	Plant competition moderate; does not prevent desirable species from becoming established but may delay regeneration and slow initial growth. Equipment limitation moderate; use restricted for a period of [illegible] to 3 months because of flooding
Loblolly pine, white ash, green ash, eastern cottonwood, red maple, cherrybark oak, Nuttall oak, overcup oak, swamp chestnut oak, water oak, white oak, willow oak, sweetgum, American sycamore	Plant competition moderate; in places delays natural regeneration and slows initial growth. Equipment limitation moderate; use restricted for a period of 1 to 3 months because of flooding
Eastern cottonwood, cherrybark oak, hackberry, pecan, sweetgum, American sycamore	Plant competition moderate to severe, depending upon management and manner of harvesting. Equipment limitation generally moderate; use restricted for a period of 1 to 3 months because of overflow
Green ash, eastern cottonwood, hackberry, cherrybark oak, pecan, sweetgum, American sycamore	Plant competition moderate to severe, depending upon management and manner of harvesting. Equipment limitation moderate; use restricted for a period of 1 to 3 months because of backwater in the adjacent areas
Green ash, baldcypress, water tupelo, black willow	Plant competition moderate to severe, depending upon management and manner of harvesting. Equipment limitation severe; water stands on or near the surface much of the year
Severely eroded ridgetops and upper slopes of less than 17 percent: Loblolly pine, shortleaf pine. Middle and lower slopes and all slopes of more than 17 percent: Cherrybark oak, white oak, Shumard oak, black oak, water oak, sweetgum, yellow-poplar	Plant competition moderate to severe. Seedling mortality on the severely eroded and gullied areas moderate to severe; interplanting usually necessary. Equipment limitation moderate to severe because of steep slopes. Erosion hazard severe; allow only a minimum of soil disturbance.
Loblolly pine, sweetgum, cherrybark oak	Plant competition severe; in places it is necessary to remove unwanted shrubs and trees. Seedling mortality moderate; regeneration cannot always be relied upon for restocking. Windthrow hazard severe because of the shallowness to the fragipan. Equipment limitation severe; areas are ponded during wet season
Eroded areas: Loblolly pine. Noneroded areas: Cherrybark oak, white oak, Shumard oak, black oak, water oak, sweetgum, yellow-poplar	Plant competition moderate; delays regeneration and initial growth. Seedling mortality generally slight to moderate. Erosion hazard slight to moderate; on the steeper slopes location of roads and skid trails is important.

[1] Pine: Trees 9 inches or more diameter at breast height; adapted from U.S.D.A. Miscellaneous Publication 50 (8).
Cottonwood: Trees 2[illegible] inches or more diameter at breast height; adapted from table 7, Agricultural Handbook 181 (7).
Sweetgum: Trees 28 inches or more diameter at breast height; adapted from table 7, Agricultural Handbook 181 (7).
Southern oaks: Trees 28 inches or more diameter at breast height; adapted from table 8, Agricultural Handbook 181 (7).
Not estimated

silt loam. It is about 16 to 28 inches beneath the surface and is at least 24 inches thick. The fragipan restricts the depth to which roots can grow and thereby limits the amount of moisture available to plants. The soils in this group are—

Calloway silt loam.
Grenada silt loam, 0 to 2 percent slopes.
Grenada silt loam, 2 to 5 percent slopes.
Grenada silt loam, 2 to 5 percent slopes, eroded.
Grenada silt loam, 5 to 8 percent slopes, severely eroded.

Loblolly pine and shortleaf pine are suited to the eroded or severely eroded soils. Hardwoods are suited to the noneroded soils, especially to the middle and lower slopes of these soils. Suitable hardwoods are cherrybark oak, Shumard oak, water oak, white oak, and sweetgum.

In places plant competition delays the natural regeneration of trees and slows initial growth, but it does not prevent desirable species from becoming established.

In years of normal rainfall, the loss of planted stock is less than 25 percent, and satisfactory restocking is obtained from the first planting. In years of low rainfall, losses of planted stock are much greater, and additional plantings are needed to fill in openings.

Because the fragipan restricts the root zone in these soils, the windthrow hazard is slight to moderate.

There generally is no problem in the use of equipment, except in a few of the low flat areas that stay wet for periods of 1 to 3 months.

WOODLAND SUITABILITY GROUP 5

This group consists of moderately well drained, acid soils that formed in alluvium derived from loess. The subsoil is silt loam or silty clay loam. The soils in this group are—

Collins silt loam.
Collins silt loam, local alluvium.

Hardwoods are better suited to these soils than pine. Open fields that are planted to loblolly pine generally revert to hardwoods after the first planting has been harvested. Suitable hardwoods are eastern cottonwood, southern magnolia, cherrybark oak, Shumard oak, swamp chestnut oak, water oak, white oak, willow oak, sweetgum, American sycamore, black tupelo, and yellow-poplar.

In places plant competition delays the natural regeneration of trees and slows initial growth, but it does not prevent desirable species from becoming established.

Seedling mortality generally is slight where the light is adequate and flooding is not too severe (fig. 5).

Windthrow is not a serious hazard. Individual trees can be expected to remain standing, even when released on all sides.

The use of equipment may be restricted for periods of 1 to 3 months by flooding.

WOODLAND SUITABILITY GROUP 6

This group consists of silty, acid soils that formed in alluvium washed from the loess hills. These soils are somewhat poorly drained. The texture of the subsoil ranges from silt loam to silty clay loam. Permeability is moderate to slow. The available moisture capacity is high. The soils in this group are—

Falaya silt loam.
Falaya silt loam, local alluvium.

Figure 5.—Slight seedling mortality is expected on area cleared of undesirable species.

Hardwoods are better suited to these soils than pine. Open fields that are planted to loblolly pine generally revert to hardwoods after the first planting of loblolly pine has been harvested. Suitable hardwoods are white ash, green ash, eastern cottonwood, red maple, cherrybark oak, Nuttall oak, overcup oak, swamp chestnut oak, water oak, white oak, willow oak, sweetgum, and American sycamore.

In places plant competition delays the natural regeneration of trees and slows initial growth, but it does not prevent desirable species from becoming established.

Seedling mortality generally is slight where the light is adequate and flooding is not too severe.

Windthrow is not a serious hazard. Individual trees can be expected to remain standing, even when released on all sides.

The use of equipment may be restricted for periods of 1 to 3 months by flooding.

WOODLAND SUITABILITY GROUP 7

This group consists of medium-textured, somewhat poorly drained to well drained soils. These soils formed in moderately fine textured to moderately coarse textured sediments deposited by the Mississippi River. They are on nearly level recent natural levees. The subsoil is silty clay loam or sandy loam, stratified in places with silt loam, sandy loam, and loamy sand. Permeability is moderate. The reaction is slightly acid to mildly alkaline. The soils in this group are—

Commerce silt loam.
Commerce silty clay loam.
Commerce very fine sandy loam.
Commerce, Robinsonville, and Crevasse soils.
Robinsonville loam.

Pine does not grow naturally on these soils. Some of the suitable hardwoods are eastern cottonwood, cherry-

bark oak, hackberry, pecan, sweetgum, and American sycamore.

Plant competition is moderate to severe, depending upon management and the manner of harvesting. In places moderate competition delays natural regeneration and [illegible] trolled by burning, applying chemical sprays, clearing, [illegible]

Seedling mortality generally is slight unless flooding is severe.

Windthrow is not a serious hazard. Individual trees can be expected to remain standing, even when released [illegible]

The use of equipment is restricted for periods of 1 to [illegible] months or more by flooding.

WOODLAND SUITABILITY GROUP [illegible]

This group consists of one nearly level to sloping soil [illegible] loam to loamy sand. The subsoil is dominantly loamy [illegible] and is easily penetrated by roots. It is low in organic [illegible] Permeability is rapid, and the available moisture capacity is low, but in places the subsoil is recharged by a fairly high water table. The mapping unit is—

[illegible]

Pine does not grow naturally on this soil. Some of the [illegible] hackberry, cherrybark oak, pecan, sweetgum, and American sycamore.

Plant competition is moderate to severe, depending [illegible] places moderate competition delays natural regeneration and slows the initial growth of trees, but it does not prevent an adequate stand of desirable species from becoming [illegible] controlled by burning, applying chemical sprays, clearing, [illegible] ration.

The use of equipment may be restricted in some areas by [illegible] stricts the use of equipment for periods of 1 to 3 months or more.

In years of normal rainfall, seedling mortality generally is slight and satisfactory restocking is obtained from the first planting. Replanting may be necessary after a growing season of low rainfall.

Individual trees can be expected to remain standing, even when released on all sides. Consequently, cutting may be done without danger of future losses by windthrow, except those losses from abnormally high winds.

WOODLAND SUITABILITY GROUP [illegible]

This group consists of fine-textured and medium-textured, very poorly drained and poorly drained, acid soils on first bottoms, in depressions, and in former channels. These soils are flooded frequently, and water stands on the surface much of the time. The supply of moisture is good to excessive. Permeability is very slow to moderate. The soils in this group are—

Dowling clay
Swamp.
Waverly and Falaya silt loams

Pine does not normally grow on these soils. [illegible] green ash, water tupelo, and black willow.

Plant competition is moderate to severe, depending upon management and the manner of harvesting. In places moderate competition delays natural regeneration and slows the initial growth of trees, but it does not prevent an adequate stand of desirable species from becoming [illegible] be controlled by burning, applying chemical sprays, clearing, diskong, and other prescribed methods of seedbed preparation.

Seedling mortality is slight. Satisfactory restocking with suitable trees is obtained from the first planting. If [illegible] tion is not severe, a satisfactory stand is obtained through natural regeneration.

Windthrow is not a serious hazard. Individual trees can be expected to remain standing when released on all sides.

[illegible] consequently, the use of equipment is severely limited. [illegible] can be utilized fully. Outlets are not available in all such places, and the cost of constructing suitable outlets is high.

WOODLAND SUITABILITY GROUP [illegible]

[illegible] generally is slow, and [illegible] in this group are—

[illegible]
[illegible]
Memphis and Natchez silt loams, 12 to 17 percent slopes, severely eroded
[illegible]

Pine is suited to the severely eroded ridgetops and to [illegible] alkaline materials are near the surface. Hardwoods are suited to the middle and lower slopes and to all slopes of more than 17 percent. The most common species suited [illegible] black oak, water oak, sweetgum, and yellow-poplar.

[illegible] moderate competition delays natural regeneration and slows the initial growth of trees, but it does not prevent an adequate stand of desirable species from becoming established. Where plant competition is severe, it can be [illegible]

Seedling mortality on the severely eroded and gullied areas is moderate to severe [illegible] time of planting to intercept openings and slope in the [illegible] mulching is needed.

The equipment limitation ranges from moderate to severe. The type of equipment is important also. If

tree-length logs are cut, all skidding should be done up- [illegible] woods, slides should be used for moving the sticks to landing points.

Because the erosion hazard is severe, there should be a minimum of soil disturbance. The location of roads and skid trails is very important.

WOODLAND SUITABILITY GROUP 1[illegible]

This group consists of one poorly drained, nearly level or [illegible] fragipan. [illegible] formed in loess. The subsoil is heavy silt loam or silty clay loam. The fragipan is 10 to 20 inches beneath the surface. The mapping unit is—

[illegible] silt loam

Loblolly pine and sweetgum are best suited to this soil. Competition from undesirable species is severe and in places prevents establishment of a good stand. Seedbed preparation helps seedlings to become established. Natural regeneration cannot always be relied upon for adequate restocking. Dieback is common on sweetgum. This [illegible]

The [illegible] shallow to the fragipan. The use of equipment is severely [illegible]. Areas are ponded during wet seasons of the year.

WOODLAND SUITABILITY GROUP 1[illegible]

This group consists of nearly level to strongly sloping, well-drained soils. These soils formed in loess. [illegible] subsoil ranges from silt loam to silty clay loam. Internal water [illegible] capacity is high. Because of slow infiltration, the eroded soils tend to be droughty during the summer months when rainfall usually occurs in short, hard showers. The soils in this group are—

- Memphis silt loam, 0 to 2 percent slopes
- [illegible]
- [illegible] percent slopes, eroded
- [illegible] eroded
- [illegible]
- [illegible] eroded
- [illegible] slopes
- [illegible]
- [illegible]
- Memphis and Loring silt loams, 2 to 5 percent slopes, severely eroded
- Memphis and Loring silt loams, 5 to 8 percent slopes, eroded
- Memphis and Loring silt loams, 5 to 8 percent slopes, severely eroded

Loblolly pine is suited to the severely eroded soils. Hardwoods are suited to the noneroded soils, especially [illegible] and on steep slopes. The most common species are cherrybark oak, [illegible] sweetgum, and yellow-poplar (fig. 6).

Plant competition does not prevent desirable species fr[illegible] natural regeneration [illegible]. Special seedbed preparation generally is not needed.

Seedling mortality varies; generally the loss of planted stock is less than 25 percent. In years of low rainfall, the loss of planted stock ranges from 25 to 50 percent, and

Figure 6.—Large cherrybark oak in area of intermediate cutting.

[illegible] planting is needed [illegible]. In many [illegible]

[illegible]

The erosion hazard is slight to moderate. On the steeper slopes, location of roads and skid trails is important. [illegible] should be taken in logging procedures.

The equipment limitation is slight.

Forest types

[illegible]

[illegible] of this type grow in the loessal soils [illegible] soil association [illegible] county.

[illegible]

[illegible]

Common associates are black willow, American sycamore, and red maple. Forests of this type grow along the streams (associations 1 and 2).

In this county the forest types occur as belts 2 to 10 miles wide and generally parallel to the Mississippi River. In places the elm-ash-cottonwood and oak-gum-cypress types are intermixed.

Yields from woodland

Forest stands have not been managed long enough to determine the total amount of wood that can be grown and harvested per acre in managed stands. Yields from stands that are unmanaged, though fully stocked, are not considered a true measure of productivity. They do, however, show the relative productivity of different sites, and they make it possible to compare yields of different species on the same soil.

Table 6 gives stand and yield information for loblolly pine and shortleaf pine on soils of given site indexes. The yield figures are cumulative; they include everything harvested in prior cuttings.

According to the U.S. Forest Service, commercial woodland covered 223,200 acres, or 64.4 percent of Warren County, in 1957 (9).[2] The volume of growing stock and sawtimber as of that year is given in table 7.

[2] Italic numbers in parentheses refer to Literature Cited, page 70.

TABLE 6.—*Stand and yield information for fully stocked, unmanaged, second-growth stands of loblolly pine and shortleaf pine*

Statistics are compiled from United States Department of Agriculture Miscellaneous Publication No. 50 (8). Absence of figure indicates that timber of specified size is not generally used for specified purpose

LOBLOLLY PINE

Site index	Age	Total merchantable volume per acre: More than 4 inches in diameter at breast height	Total merchantable volume per acre: More than 9 inches in diameter at breast height	Average diameter at breast height	Average yearly growth per acre of stands that are: More than 9 inches in diameter at breast height	Average yearly growth per acre of stands that are: More than 4 inches in diameter at breast height
		Cords of rough wood	*Board feet (Doyle rule)*	*Inches*	*Board feet (Doyle rule)*	*Cords of rough wood*
70.	20			5.		0.55
	30	31	1,000	8	33	92
	40	42	3,500	0.6	88	05
	50	50	6,500	0.9	30	00
	60	53	10,000	2	67	92
	70	59	12,[illegible]	3.0	9	8
	80	62	5,000	3.8	98	78
80.	20	25		6.2		0
	30	38	2,000	8.	67	27
	40	51	6,000	[illegible]	50	28
	50	60	[illegible],500	2.3	280	30
	60	66	6,000	13.6	35	0
	70	[illegible]	9,000	4.	270	00
	80	8	22,000	5.	275	0
90.	20	27		6.0		35
	30	40	4,000		33	53
	40	6	0,[illegible]		250	52
	50		6,[illegible]	0	350	42
	60	8	[illegible],000	0	36	30
	70	82	26,000	6.2	27	7
	80	85	29,000	[illegible]	363	16
100	20	32	500	7.4	35	1.60
	30	[illegible]	11,000	0.4	200	
	40		[illegible],500	2.8	[illegible]2	78
	50	84	23,000		460	65
	60	92	29,500	6.3	402	3
	70	96	33,000	7.0	7	35
	80	00	35,500	15.6	444	25

LOBLOLLY PINE—Continued

Site index	Age	Total merchantable volume per acre: More than 4 inches in diameter at breast height	Total merchantable volume per acre: More than 9 inches in diameter at breast height	Average diameter at breast height	Average yearly growth per acre of stands that are: More than 9 inches in diameter at breast height	Average yearly growth per acre of stands that are: More than 4 inches in diameter at breast height
		Cords of rough wood	*Board feet (Doyle rule)*	*Inches*	*Board feet (Doyle rule)*	*Cords of rough wood*
0	20	37	100	7.9	50	95
	30	62	9,[illegible]	2	300	2.07
	40	82	20,000	3	300	2.05
	50	98	29,[illegible]	5.7	380	.12
	60	06	36,500	4	008	1.77
	70	2	40,500	8.8	579	1.60
	80	10	43,500	20.0	544	1.45

SHORTLEAF PINE

Site index	Age	Total merchantable volume per acre: More than 4 inches in diameter at breast height	Total merchantable volume per acre: More than 9 inches in diameter at breast height	Average diameter at breast height	Average yearly growth per acre of stands that are: More than 9 inches in diameter at breast height	Average yearly growth per acre of stands that are: More than 4 inches in diameter at breast height
50	20			3.2		
	30	23		4.8		77
	40	33		6		82
	50	43	600	3	32	80
	60	48	3,200	8.3	63	80
	70	51	5,100	9.1	72	[illegible]
	80	54	7,[illegible]	9.9	68	04
60	20	2		3.8		60
	30	32		5.7		67
	40	40	550	7.3	39	5
	50	4	4,350	8.4	87	98
	60	60	[illegible],600	9.7	127	1.00
	70	65	0,250	10.0	40	03
	80	68	2,700	[illegible]4	59	85
70	20	18		4.5		00
	30	4	150	6.6	25	1.37
	40	56	4,000	8.4	100	1.40
	50	66	8,650	9.8	3	32
	60	73	2,600	0	210	1.22
	70	7	6,230	2.0	232	1.13
	80	43	0,400	12.8	242	1.04

TABLE 7.—*Volume of growing stock and of sawtimber in 1957*

Kinds of trees	Growing stock	Saw timber
[illegible]	[illegible]	[illegible]
Pines	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
Total softwoods	[illegible]	[illegible]
Cottonwood, sweetgum, yellow-poplar, and other soft hardwoods	[illegible]	[illegible]
Oaks	[illegible]	[illegible]
Ash, hickory, sycamore, and other hardwoods	[illegible]	[illegible]
Total hardwoods	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

Wildlife

[illegible] wildlife habitats, can be supplied either by natural pro[illegible]

[illegible] fish and wildlife populations most significant[illegible] for example, eat nothing but plant seeds; bluebirds and [illegible] and many other birds have a varied diet of fruits, nuts, and [illegible] foods, and hawks and owls are primarily meat [illegible]

Soils suitable for impounding water are necessary for [illegible] surface water for drinking is required by deer, doves, turkeys, and other wildlife.

Cover generally is abundant or excessive in the humid climate of Warren County. It can be grown easily where needed.

The abundance and variety of wildlife vary according to land use. For example, pasture generally affords a poor habitat unless special practices for the benefit of wildlife are carried out. Well-managed woodland provides an excellent habitat for deer, turkeys, squirrel, and [illegible] with insecticides meets the requirements of quail, [illegible]

The work unit conservationist of the Soil Conservation Service can give technical assistance to landowners who want to establish and maintain habitats for fish, game, [illegible]

The important game species and their principal food [illegible] ing paragraphs by soil associations (see colored general [illegible] 2 are on the Mississippi River alluvial plain, and association 3 is on the loess hills.

Association 1.—The Commerce-Robinsonville-Crevasse association occurs as broad, nearly level areas on recent natural levees in the western part of the county. It is mostly along the eastern side of the Mississippi River but includes also that part of the county that lies west of the [illegible] The soils are somewhat poorly drained to exces[illegible]

Approximately 65 percent of this association is subject [illegible] he acreage consists of some of the best agricultural soils in the county. It is farmed intensively and is used chiefly for cotton, soybeans, small grain, and pasture.

Clean tillage and the widespread use of hydrocarbon [illegible] for field game species, except doves. Because [illegible] game species are important.

The number of quail will increase if soybeans, browntop millet, and cowpeas are planted near good [illegible] Quail also feed on waste corn and grain sorghum, in fields [illegible]

Doves are abundant. Waste corn and grain sorghum attract them in large numbers in fall and winter. Brown[illegible]

Ditchbanks and field edges are good habitats for rabbits. The number of rabbits will increase if native cover is maintained and small strips of winter forage crops are planted near cover.

Squirrels are fairly abundant in the woodland. Good management of the hardwoods protects their habitat.

A few ducks feed in this area. Lakes, streams, and bayous offer some natural foods. When winter rains flood parts of the woodland, ducks will eat acorns in the flooded areas. Woodland duckponds can be established [illegible] topography is suitable for flooding and a permanent [illegible] of other plants suitable for duck food can be flooded, also, to form duckponds. Most of the soils in this area hold water well.

Deer and a few wild turkeys are to be found in the large timbered areas. Native plants furnish most of their food. Patches of grain, grass, or legumes can be planted in and [illegible] be spaced over the range in plots of 1 to 10 acres.

Fish, both game and commercial, are plentiful in many [illegible]

[illegible] areas, within which are scattered sloping areas along narrow depressions. The soils are fine textured and poorly drained or somewhat poorly drained.

Approximately 75 percent of the acreage is subject to [illegible] is still in forest, which varies from well-managed commercial stands to fire-razed, cutover forests that have become [illegible] acreage has been cleared and is used principally as pas[illegible]

Quail are limited to the soybean fields and adjacent ditchbanks, woods, and idle areas. Soybeans are their primary food. Quail can be encouraged and the number increased by leaving a narrow strip of soybeans unharvested along ditchbanks and edges of the woods, by encouraging native cover plants along fence rows and ditchbanks, and by refraining from burning ditchbanks

and other natural cover areas until the early or middle [illegible]

Rabbits, particularly swamp rabbits, generally are plentiful. No special management is necessary. [illegible] and grain sorghum, native grass, and weeds in fall and early in winter.

Squirrels are fairly abundant in the woodlands. Good management of hardwood trees protects their habitat.

A few ducks feed in this area. Lakes, streams, and bayous offer some natural foods. When winter rains flood parts of the woodland, ducks will eat acorns in the flooded [illegible]. Woodland duckponds can be established where more than half the trees are oaks, provided the topography [illegible] available. Fields of browntop millet or other plants [illegible]

Deer and a few wild turkeys are to be found in the larger [illegible] level and gently sloping areas are on flood plains and on [illegible]

About 75 percent of the acreage is in forest, predomi[illegible] choice food. Under suitable conditions, lespedeza [illegible] wild. It also is used in pasture sods. Habitats for quail [illegible] lespedeza near good cover plants and by planting Kobe [illegible] bicolor or lespedeza japonica) or other food crops, such as browntop millet, cowpeas, or soybeans. Planted or [illegible] foods should be spaced so that sufficient food is avai[illegible] of 1/8 to 1/4 acre are sufficient for shrub lespedezas. Other foods should be planted so that 1/2 to 1 1/2 acres will be [illegible]

Cottontail rabbits are fairly common in this area. For them, ample cover should be provided along fence [illegible] field borders, and odd corners. Small patches and [illegible] ply. The number of rabbits will increase if cover plants are grown along fences and along the edges of pastures [illegible] flora rose furnish excellent cover and travel lanes for rabbits.

W[illegible] and winter. Corn and grain sorghum are important sources of food. Browntop millet is one of the more productive crops. The numerous farm ponds in this area supply ample water for doves.

Squirrels are plentiful in the hardwood forest [illegible] River alluvial plain. Good management of the hardwoods will protect the squirrel habitat. In addition to the oaks, which are maintained as commercial species, a few hickories in the stand will benefit the squirrels. In the eastern part of this general area, squirrels are less plentiful, and their habitats are mainly on the bottom lands and lower slopes and near the heads of drains.

The number of deer is increasing in the woodlands of [illegible] plemental food can be provided by planting winter forage [illegible]

A large number of farm ponds produce from 200 to 400 [illegible] rectly and if the fertility is maintained at a high level.

Engineering Uses of the Soils[3]

Some soil properties are of special interest to engineers [illegible] roads, airports, pipelines, building foundations, facilities for water storage, erosion-control structures, drainage systems, and sewage-disposal systems. The properties most important to the engineer are permeability to water, shear [illegible] swell characteristics, grain size, plasticity, and pH. [illegible] raphy are important also.

Information in this report can be used to—

1. Make soil and land use studies that will aid in the selection and development of industrial, business, residential, and recreational sites.
2. Make reconnaissance surveys of soil and ground [illegible] ports and in planning detailed soil surveys at the selected locations.
3. Locate sources of sand and gravel.
4. Correlate pavement performa[illegible]
[illegible]
6. Estimate the nature of material likely to be en[illegible] structures.
[illegible]
8. Determine the suitability of soils for septic tanks [illegible]
[illegible] lished maps and reports and aerial photographs, for the purpose of making soil maps and reports that can be used readily by engineers.
10. Develop other preliminary estimates for construc[illegible] purposes pertinent to the particular area.

[3] [illegible] Mississippi State Highway Department and W. A. Carr of [illegible]

This report will not eliminate the need for on-site sampling and testing of soils for design and construction of specific engineering works and uses. It should be used primarily in planning more detailed field investigations to determine the condition of soil material in place at the proposed site.

Some terms used by the soil scientist may be unfamiliar to engineers, and some words—for example, soil, clay, silt, sand—have special meanings in soil science. These and other terms used in the report are defined in the Glossary at the end of the report.

To make the best use of the soil map and soil survey report, the engineers need to know some of the physical and chemical properties of the soil material and the in-place condition of the soil.

Engineering classification systems

Two systems of classifying soils, the AASHO and the Unified, are in general use among engineers. Both are used in this report.

Most highway engineers classify soil material according to the system approved by the American Association of State Highway Officials (*1*). In this system the soil material is classified in seven principal groups. The groups range from A-1, which consists of gravelly soils of high bearing capacity, to A-7, which consists of clay soils having low strength when wet. In each group the relative engineering value of the soil material is indicated by a group index number. Group index numbers range from 0 for the best material to 20 for the poorest. The group index number, if it has been determined, is shown in parentheses following the soil group symbol.

Some engineers prefer to use the Unified soil classification system (*12*). In this system, soil material is identified as coarse grained (eight classes), fine grained (six classes), and highly organic. An approximate classification of soils by this system can be made in the field.

The PCA Soil Primer (*6*) is a useful reference that includes explanations of both classification systems.

Engineering test data

Engineers have tested some of the soils in Warren County and have observed their behavior in engineering structures. The test data are given in table 8.

Each soil was sampled to a depth of about 6 feet. The test data show some variations in the characteristics of these soils but probably do not show the entire range of variations that occur in the lower horizons. The data, therefore, may not be adequate for estimating the characteristics of soil material in deep cuts or on rolling topography.

The engineering classifications in the last two columns of table 8 are based on data obtained by mechanical analysis and by tests to determine liquid limit and plastic limit. The mechanical analysis was made by combined hydrometer and sieve methods. The grain sizes used by

TABLE 8.—*Engineering*

[Tests performed by the Bureau of Public Roads in accordance with standard procedures of the American Association of State Highway ... in Issaquena County, Miss. Dashes

Soil name and location of samples	Parent material	Bureau of Public Roads report number	Depth	Horizon
Bowdre clay,			In.	
[illegible] mile NW. of Tallula, Issaquena County, Miss. (modal profile).	Slack-water clay over fine-textured alluvium.	S34126	4 to [illegible]	A2
		S34127	[illegible] to 14	[illegible]
		S34128	14 to 33	[illegible]
		S34129	33 to 72+	[illegible]
1.5 miles N. of Fitler, Issaquena County, Miss. (underlain by clay).	Slack-water clay over fine-textured alluvium.	S34130	0 to 15	A2
		S34131	2[illegible] to 35	
		S34132	35 to 58	[illegible]
2 miles NW. of Grace, Issaquena County, Miss. (sandy D horizon).	Slack-water clay over fine-textured alluvium.	S34133	4 to [illegible]	A2
		S34134	[illegible] to 20	[illegible]
		S34135	27 to 72	[illegible]
Commerce silt loam:				
3 miles NW. of Mayersville, Issaquena County, Miss. (modal profile).	Recent alluvium.	S34136	0 to 7	AC
		S34137	7 to 44	C1
		S34138	44 to 54	C2
200 yards E. of Tallula, Issaquena County, Miss. (sandy loam C horizon).	Recent alluvium.	S34139	0 to 22	AC
		S34140	22 to 48	C1
		S34141	48 to 72	C2
Commerce silty clay loam:				
0.25 mile E. of Tallula, Issaquena County, Miss. (high in silty clay loam).	Recent alluvium.	S34142	4 to 9	A[illegible]
		S34143	20 to 52	C1
		S34144	52 to 72+	C2

See footnotes at end of table.

engineers are different from the sizes used by soil scientists, therefore, the percentages given in table 8 should not be used in naming soil textural classes.

The tests for liquid limit and plastic limit measure the effect of water on the consistence of soil material. As the moisture content of a clayey soil increases from a very dry state, the material changes from a semisolid to a plastic state. As the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material passes from a semisolid to a plastic state. The liquid limit is the moisture content at which the soil material passes from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is in a plastic condition.

Table 8 also gives compaction (moisture-density) data for some of the soils tested. If a soil material is compacted at successively higher moisture content, assuming that the compactive effort remains constant, the density of the compacted material will increase until the "optimum moisture" content is reached. After that, the density decreases with increase in moisture content. The highest dry density obtained in the compaction test is termed "maximum dry density." Moisture-density data are important in earthwork, for as a rule, optimum stability is obtained if the soil is compacted to about the maximum dry density when it is at approximately the optimum moisture content.

Brief description of soils and their estimated physical and chemical properties

The estimated physical and chemical properties of each soil delineated on the map are given in table 9. The estimates are based on the results of laboratory tests and on field observations of and experience with the behavior of the soils in engineering structures. The data in table 9 apply only to the soils of Warren County.

Permeability, in inches per hour, is estimated for the undisturbed soil. The estimates are based on structure and porosity and on permeability tests of undisturbed cores of similar soil material.

The available water capacity, in inches per inch of soil depth, is the approximate amount of water that the soil can hold in a form available to plants. It is the difference between the amount of water in the soil at field capacity (approximately ⅓ atmosphere for silty and clayey soils and ⅒ atmosphere for sandy soils) and the amount at the time plants wilt (approximately 15 atmospheres of tension).

The shrink-swell potential is an indication of the volume change to be expected with a change in moisture content. This potential is based on volume change tests or on observations of other physical properties or characteristics of the soil. In general, soils classified as CH and A-7 have a high shrink-swell potential. Clean sands and

test data

Officials (AASHO). None of the profiles in this table represent soils of the same series as in Warren County and were taken from locations indicate that information is not available]

Moisture-density data: Maximum dry density	Moisture-density data: Optimum moisture	Mechanical analysis[1] — Percentage passing sieve: No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 60 (0.25 mm.)	No. 200 (0.074 mm.)	Percentage smaller than: 0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.	Liquid limit	Plasticity index	Classification: AASHO[2]	Unified[3]
Lb. per cu. ft.	Pct.												
				100	95	90	7[illegible]	65	44	52	24	A-7-6(16)	MH-CH
				100	95	81	47	28	24	33	12	A-6(9)	CL
				100	87	62	3[illegible]	19	5	29	6	A-4(6)	ML-CL
				90	8[illegible]	[illegible]	8	6	4	NP	NP	A-2-4(0)	SM
				100	95	80	75	65	54	64	34	A-7-5(20)	MH-CH
				100	96	83	4[illegible]	20	22	33	2	A-6(9)	CL
				100	97	64	25	[illegible]	2	27	5	A-4(8)	ML-CL
			100	99	95	93	82	76	68	8[illegible]	49	A-7-5(20)	CH
			[illegible]	99	63	50	43	34	30	38	21	A-6(10)	CL
			[illegible]	85	6	5	[illegible]	2	2	NP	NP	A-3(0)	SP-SM
					100	94	50	20	6	31	7	A-4(8)	ML
				100	97	80	33	8	6	26	3	A-4(8)	ML
				9[illegible]	99	98	64	55	30	67	32	A-7-5(20)	CH
				100	95	83	45	20	6	3[illegible]	0	A-4(8)	ML-CL
				100	73	51	24	0	5	24	[illegible]	A-4(8)	ML
				100	95	86	46	[illegible]	3	3[illegible]	6	A-4(8)	ML-CL
				100	99	94	70	44	33	46	22	A-7-6(14)	CL
				100	93	70	30	15	12	28	6	A-4(8)	ML-CL
				100	99	98	65	30	23	37	14	A-6(10)	ML-CL

TABLE 8.—*Engineering*

[Tests performed by the Bureau of Public Roads in accordance with standard procedures of the American Association of State Highway [illegible] in Issaquena County, Miss. [illegible]

Soil name and location of samples	Parent material	Bureau of Public Roads report number	Depth	Horizon
Falaya silt loam:			*In.*	
NE¼NW¼ sec. 23, T. 14 N., R. 4 E., Warren County, Miss. (modal profile).	Loess.	S34032	0 to 6	A
		S34033	6 to 18	A2
		S34034	18 to 48+	A3
SE¼NE¼ sec. 29, T. 14 N., R. 4 E., Warren County, Miss. (more poorly drained than the modal profile).	Loess.	S34035	0 to 3	A1
		S34036	3 to 14	A2
		S34037	14 to 48	A3
SE¼NW¼ sec. 7, T. 6 N., R. 5 E., Warren County, Miss. (black silty clay loam).	Loess.	S34038	[illegible] to 12	A2
		S34039	15 to 29	A4
		S34040	44 to 54	A6
Loring silt loam:				
NW¼SE¼ sec. 2[illegible], T. 7 N., R. 5 E., Warren County, Miss. (modal profile).	Loess.	S34041	0 to 4	Ap
		S34042	[illegible] to 14	[illegible]
		S34043	49 to 76	[illegible]m2
SW¼SE¼ sec. 2[illegible], T. [illegible] N., R. 5 E., Warren County, Miss. (modal profile).	Loess.	S34044	[illegible]	B22
		S34045	33 to 55	B3m[illegible]
		S34046	65 to [illegible]	C
SE¼NE¼ sec. 20, T. 6 N., R. 5 E., Warren County, Miss. (shallower than the modal profile).	Loess.	S34047	1 to 4	A[illegible]
		S34048	8 to 13	B22
		S34049	23 to 46	B3m
Memphis silt loam:				
NW¼SW¼ sec. [illegible], T. 7 N., R. 5 E., Warren County, Miss. (modal profile, moderately eroded).	Loess.	S34050	2 to 8	A[illegible]
		S34051	3 to 23	B[illegible]
		S34052	5[illegible] to 67	C
NW¼SW¼ sec. [illegible], T. 17 N., R. 5 E., Warren County, Miss. (modal profile, severely eroded).	Loess.	S34053	5 to 14	B22
		S34054	28 to 39	B3[illegible]
		S34055	53 to 65	C1
Natchez silt loam:				
SW¼NE¼ sec. 26, T. 15 N., R. 3 E., Warren County, Miss. (modal profile, moderately eroded).	Loess.	S34056	4 to [illegible]	B2
		S34057	26 to 88+	
NW¼NE¼ sec. 2[illegible], T. 14 N., R. 3 E., Warren County, Miss. (modal profile, severely eroded).	Loess.	S34058	[illegible] to 7	B2
		S34059	[illegible] to 20	B22
		S34060	26 to 84+	C
SW¼NE¼ sec. 3, T. 15 N., R. 3 E., Warren County, Miss. (A–C profile).	Loess.	S34061	3 to 16	A2
		S34062	36 to 72+	C2
Sharkey clay:				
2 miles NE. of Tallula, Issaquena County, Miss. (modal profile).	Slack-water sediments.	S34145	4 to 23	A21
		S34146	23 to 46	C
		S34147	46 to 72+	D
2 miles NE. of Fitler, Issaquena County, Miss. (fine textured).	Slack-water sediments.	S34148	3 to 43	A2
		S34149	45 to [illegible]2	C
2.5 miles SE. of Grace, Issaquena County, Miss. (stratified).	Slack-water sediments.	S34150	6 to 40	A2
		S34151	44 to 55	D2
		S34152	58 to 72	D3

[1] Based on Moisture-Density Relations of Soils Using a 5.5-lb. Rammer and a 12-in. Drop, AASHO Designation: T 99-5[illegible], Method A.

[2] Mechanical analysis according to AASHO Designation: T 88. Results by this procedure frequently differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The data used in this table are not suitable for use in naming textural classes of soils.

test data—Continued

Officials (AASHO). None of the profiles in this table represent soils of the same series as in Warren County and were taken from locations ... indicate that information is not available]

Moisture-density data: Maximum dry density	Moisture-density data: Optimum moisture	Mechanical analysis — Percentage passing sieve: No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 60 (0.25 mm.)	No. 200 (0.074 mm.)	Percentage smaller than: 0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.	Liquid limit	Plasticity index	Classification: AASHO [3]	Unified [4]
Lb. per cu. ft.	*Pct.*												
100	20			100	99	97	67	21	15	35	8	A-4(8)	ML
107	17				100	97	64	16	13	30	7	A-4(8)	ML-CL
107	17				100	98	61	16	2	30	6	A-4(8)	ML-CL
100	18	100	99	99	98	96	57	17	3	30	5	A-4(8)	ML
99	22		100	99	97	96	80	44	33	45	18	A-7-6(12)	ML-CL
105	19			100	99	97	66	28	21	36	12	A-6(9)	ML-CL
106	17				100	98	69	21	16	32	8	A-4(8)	ML-CL
[illegible]	16			[illegible]	99	95	74	24	0	32	8	A-4(8)	ML-CL
101	22			99	99	98	91	52	43	64	36	A-7-6(20)	CH
105	7				100	97	58	10	14	29	4	A-4(8)	ML
96	20				100	98	66	33	28	43	18	A-7-6(12)	ML-CL
109	[illegible]				100	98	64	25	9	27	4	A-4(8)	ML-CL
104	20				99	98	76	35	31	43	18	A-7-6(12)	ML-CL
109	[illegible]				100	97	64	25	19	35	12	A-6(9)	ML-CL
[illegible]	[illegible]				100	98	61	19	14	31		A-4(8)	ML-CL
108	[illegible]				100	9[illegible]	62	22	9	30		A-4(8)	ML-CL
[illegible]	[illegible]				100	98	[illegible]	38	29	46	20	A-7-6(1?)	[illegible]
[illegible]	6				100	98	68	21	20	31	9	A-4(8)	ML-CL
107	15				100	97	62	21	16	26	7	A-4(8)	ML-CL
98	18				100	98	69	33	28	47	2[illegible]	A-7-6(1?)	CL
[illegible]	7				100	97	[illegible]	20	1[illegible]	31	8	A-4(8)	ML
104	19				100	98	72	36	30	48	22	A-7-6(14)	ML-CL
[illegible]	7				100	97	66	28	22	38	15	A-6(10)	ML-CL
[illegible]	5				100	96	62	32	18	36	12	A-6(9)	ML-CL
[illegible]	6				100	97	62	21	15	33	7	A-4(8)	ML
[illegible]	6	99	98	97	95	92	50	10	7	29	5	A-4(8)	ML-CL
[illegible]	8				100	98	79	29	25	40	15	A-6(10)	ML-CL
[illegible]	6				100	97	65	23	15	30	2	A-4(8)	ML-CL
[illegible]	6	100	97	96	94	91	58	13	9	28	4	A-4(8)	ML-CL
105	7				100	97	64	2[illegible]	[illegible]	35	9	A-4(8)	ML-CL
[illegible]		99	99	99	95	86	58	[illegible]	[illegible]	27	4	A-4(8)	ML-CL
				99	99	97	90	83	74	94	53	A-7-5(20)	MH-CH
				100	99	98	81	62	5[illegible]	65	38	A-7-6(20)	CH
				100	95	7[illegible]	40	24	20	34	2	A-6(?)	ML-CL
					100	98	90	73	62	82	46	A-7-5(20)	MH-CH
					100	98	86	6[illegible]	49	67	37	A-7-5(20)	CH
					99	99	9[illegible]	68	51	72	38	A-7-5(20)	MH-CH
					100	99	93	7[illegible]	66	74	44	A-7-5(20)	CH
					100	98	92	81	70	98	60	A-7-5(20)	CH

[3] Based on Standard Specifications for Highway Materials and Methods of Sampling and Testing (Pt. 1, Ed. 7): The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes, AASHO Designation: M 145-49 ( ).

[4] Based on the Unified Soil Classification system, Technical Memorandum No. 3-357, v. 1, Waterways Experiment Station, Corps of Engineers, March 1953 (12).

[5] Nonplastic.

TABLE 9.—*Brief description of soils and their*

Map symbol	Soil	Description of soil and site	Depth from surface	Classification
				USDA textural class
			In.	
Ad	Adler silt loam.	Moderately well drained, friable alluvial silt loam about 4 to 6 feet or more thick; seasonally high water table at a depth of 1½ to 2½ feet.	0 to 48	Silt loam.
Am	Adler and Morganfield silt loams, local alluvium.	About 2 to 2½ feet of moderately well drained to well drained silt loam (local alluvium) over 1½ to 2 feet of silty clay loam or heavy silt loam; seasonally high water table at a depth of 1½ to 2½ feet.	0 to 24 24 to 48 48 to 50+	Silt loam. Silty clay loam. Silt loam.
A	Alligator clay.	Poorly drained silty clay or clay about ½ foot thick over 3 feet or more of massive clay; seasonally high water table at the surface.	0 to 6 6 to 36+	Clay or silty clay. Clay.
Bn	Bowdre silty clay.	About ½ foot to 1½ feet of moderately well drained silty clay or clay over sandy loam stratified in places with silt loam, loam, and loamy sand; seasonally high water table at a depth of ½ foot to 2 feet.	0 to 18 18 to 28 28 to 34 34 to 40	Silty clay. Fine sandy loam. Loamy sand. Fine sandy loam.
Ca	Calloway silt loam.	About ½ foot of silt loam over 1 foot of silt loam or silty clay loam underlain by silt loam fragipan 2 to 3 feet thick; internal drainage impeded by fragipan; seasonally high water table at a depth of about ½ foot to 1½ feet.	0 to 6 6 to 18 18 to 45+	Silt loam. Silt loam or silty clay loam. Silt loam.
C	Collins silt loam.	Moderately well drained alluvial silt loam 4 to 6 feet or more thick; seasonally high water table at a depth of 1½ to 2½ feet.	0 to 50+	Silt loam.
Cm	Collins silt loam, local alluvium.	Moderately well drained alluvial silt loam, 2 to 2½ feet thick, over silty clay loam 2 to 3 feet thick; seasonally high water table at a depth of 1½ to 2½ feet.	0 to 24 24 to 48 48 to 50	Silt loam. Silty clay loam. Silt loam.
Cn	Commerce silt loam.	Somewhat poorly drained to moderately well drained silt loam 1 foot to 2 feet thick, over stratified, medium-textured Mississippi River alluvium; seasonally high water table at a depth of ½ foot to 2 feet.	0 to 22 22 to 27 27 to 40	Silt loam. Heavy silt loam. Very fine sandy loam.
Co	Commerce silty clay loam.	Somewhat poorly drained to moderately well drained silty clay loam ½ foot to 2 feet thick, over stratified, medium-textured Mississippi River alluvium; seasonally high water table at a depth of ½ foot to 2 feet.	0 to 10 10 to 20 20 to 40+	Silty clay loam. Silt loam. Very fine sandy loam.
Cp	Commerce very fine sandy loam.	Somewhat poorly drained to moderately well drained silt loam, 1 foot to 2 feet thick, over medium-textured, Mississippi River alluvium; seasonally high water table at a depth of ½ foot to 2 feet.	0 to 2 2 to 24 24 to 48+	Very fine sandy loam. Heavy silt loam. Very fine sandy loam.
Cr	Commerce, Robinsonville, and Crevasse soils.	Somewhat poorly drained to excessively drained soils, subject to overflow and backwater; variable Mississippi River alluvium ranging from silt loam to loamy sand.	0 to 48	Variable.
Cy	Crevasse fine sandy loam.	Excessively drained, stratified loamy sand, sand, and sandy loam about 4 to 8 feet thick; seasonally high water table at a depth of 3 to 4 feet.	0 to 6 6 to 28 28 to 41	Fine sandy loam. Loamy sand. Fine sandy loam.
Do	Dowling clay.	Poorly drained, clayey soils in depressions; seasonally high water table at or above surface.	0 to 36+	Clay.

See footnote at end of table.

estimated physical and chemical properties

Classification—Con.		Percentage passing sieve—			Permeability	Available water capacity	Reaction	Salinity	Dispersion	Shrink-swell potential
Unified	AASHO	No. 4 (4.76 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)						
					In. per hr.	*In. per in. of soil*	*pH*			
ML or ML-CL	A-4 or A-6			00	0.8 to 2.5	0.20 to 0.25	6.5 to 7.5	None	High.	Low.
ML-CL	A-4			100	0.8 to 2.5	0.25	6.5 to 7.5	None	High.	Low.
ML-CL	A-6.			00	0.8 to 2.5	0.30	7.0 to 7.5	None	Moderate.	Moderate.
ML-CL	A-4			00	0.8 to 2.5	0.2[illegible]	[illegible]0 to 7.5	None	High.	Low.
CH	A-7			100	0 to 0.05	0.25	4.5 to 6.0	None	Low	High.
CH	A-7		00	99	0 to 0.05	0.25	4.5 to 6.5	None	Low	High.
CH	A-7		100	85	0 to 0.05	0.25	6.5 to 7.5	None.	Low	High.
ML	A-4.		00	55	0.8 to 2.5	0.[illegible]3	6.5 to 8.0	None	Moderate	Moderate.
SM	A-2		100	20	5.0 to [illegible]0.0	0.07	6.5 to 8.[illegible]	None	High.	Low
ML	A-4		100	50	0.8 to 2.5	0.[illegible]2	6.5 to 8.[illegible]	None	High.	Low
ML-CL	A-4		00	99	0.8 to 2.5	0.25	5.0 to 5.5	None	High	Low.
CL	A-6 or A-7		00	99	0.8 to 2.5	0.30	5.[illegible] to 5.5	None	Moderate.	Moderate.
ML-CL	A-4		100	99	0.[illegible] to [illegible].5	[illegible]	5.0 to 5.5	None	Moderate to high.	Low
ML-CL	A-4		100	99	0.8 to 2.5	[illegible].20 to 0.25	5.5 to 6.[illegible]	None	High.	Low.
ML-CL	A-4		100	90	0.8 to 2.5	0.20	6.5 to 6.5	None	High	Low.
ML-CL	A-6		100	99	0.8 to 2.5	0.30	5.5 to 6.5	None	Moderate.	Moderate.
ML-CL	A-4		100	99	0.8 to 2.5	0.25	5.[illegible] to 6.5	None	High.	Low.
ML-CL	A-4.		00	70	0.8 to 2.5	0.20	6.5 to [illegible].5	None	High	Low
CL	A-6		100	95	0.8 to 2.5	0.25	6.5 to 7.5	None	High	Low to moderate
ML	A-4		00	60	[illegible].8 to 2.5	0.[illegible]8	[illegible]0 to 8.0	None	High.	Low.
CL	A-6		00	95	0.2 to 0.8	0.2[illegible]	6.5 to [illegible].5	None	Moderate	Moderate.
ML-CL	A-4 or A-6		00	[illegible]5	0.8 to 2.5	0.20	6.5 to 7.5	None	High.	Low
ML-CL	A-4		00	65	0.8 to 2.5	0.18	7.0 to 8.0	None.	High.	Low
ML-CL	A-4		100	50	0.8 to 2.5	0.[illegible]8	6.5 to 7.5	None.	Low	Low.
ML-CL	A-6		00	90	0.8 to 2.5	0.25	6.5 to 7.5	None	Moderate.	Moderate.
ML-CL	A-4		00	65	0.8 to 2.5	0.[illegible]8	7.0 to 8.0	None	Low	Low.
							6.5 to 8.4	None	High	Low
SM	A-4		100	35	2.5 to 5.0	0.12	6.5 to 7.5	None.	High	Low
SM	A-2		00	[illegible]5	5.0 to 10.0	0.07	6.5 to 7.5	None.	High	Low
SM	A-4 or A-2		100	25	2.5 to 5.0	0.12	6.5 to 7.5	None	High	Low
CH	A-7		100	95	0 to 0.05	0.25	5.5 to 7.5	None	Low	High.

TABLE 9.—*Brief description of soils and their*

Map symbol	Soil	Description of soil and site	Depth from surface	Classification: USDA textural class
			In.	
Fa	Falaya silt loam.	Somewhat poorly drained, alluvial silt loam stratified with silty clay loam and more than 4 feet thick; seasonally high water table at a depth of ½ foot to 1½ feet.	0 to 50+	Silt loam
F	Falaya silt loam, local alluvium.	Somewhat poorly drained silt loam local alluvium, about 1½ to 3 feet thick, over silty clay loam or heavy silt loam; seasonally high water table at a depth of ½ foot to 1½ feet.	0 to 24 24 to 48 48+	Silt loam. Silty clay loam. Silt loam.
GrA	Grenada silt loam, 0 to 2 percent slopes.	Moderately well drained silt loam, about 1 foot thick, over 1 foot of silty clay loam; underlain by a silt loam fragipan, 2 to 3 feet thick; internal drainage impeded by fragipan; seasonally high water table at a depth of 1½ to 2½ feet.	0 to 14 14 to 22 22 to 50+	Silt loam Silty clay loam Silt loam
GrB	Grenada silt loam, 2 to 5 percent slopes.			
GrB2	Grenada silt loam, 2 to 5 percent slopes, eroded.			
GrC3	Grenada silt loam, 5 to 8 percent slopes, severely eroded.			
Gu	Gullied land.	Gullies formed in loessal material; texture is silt, silt loam, and silty clay loam; gullies are 3 to 30 feet deep and 3 to 50 feet wide.	0 to 14+	Silt to silty clay loam.
Hn	Henry silt loam.	Poorly drained silt loam, about ½ foot thick, over about ½ to 1 foot of silty clay loam; underlain by a dense fragipan of heavy silt loam; internal drainage impeded by fragipan; seasonally high water table at or above the surface.	0 to 5 5 to 12 12 to 36 36 to 55	Silt loam. Silt loam. Heavy silt loam Silt loam
MeA	Memphis silt loam, 0 to 2 percent slopes.	Well-drained silt loam, ½ foot to 1½ feet thick, over 1½ to 2½ feet of silty clay loam; underlain by silt loam or silt; seasonally high water table at a depth of 5 to 20 feet or more.	0 to 9 9 to 31 31 to 67	Silt loam Silty clay loam Silt loam
MeB	Memphis silt loam, 2 to 5 percent slopes.			
MeB2	Memphis silt loam, 2 to 5 percent slopes, eroded.			
MeB3	Memphis silt loam, 2 to 5 percent slopes, severely eroded.			
MeC2	Memphis silt loam, 5 to 8 percent slopes, eroded.			
MeC3	Memphis silt loam, 5 to 8 percent slopes, severely eroded.			
MlA	Memphis and Loring silt loams, 0 to 2 percent slopes.	Generally well-drained silt loam, about ½ foot to 1½ feet thick, over 1½ to 2½ feet of silty clay loam; underlain by silt loam or silt; a weak fragipan about 3 feet below the surface in some areas; seasonally high water table at a depth of 3 to 20 feet.	0 to 9 9 to 31 31 to 67	Silt loam Silty clay loam Silt loam
MlB	Memphis and Loring silt loams, 2 to 5 percent slopes.			
MlB2	Memphis and Loring silt loams, 2 to 5 percent slopes, eroded.			
MlB3	Memphis and Loring silt loams, 2 to 5 percent slopes, severely eroded.			
MlC2	Memphis and Loring silt loams, 5 to 8 percent slopes, eroded.			
MlC3	Memphis and Loring silt loams, 5 to 8 percent slopes, severely eroded.			
MnD3	Memphis and Natchez silt loams, 8 to 12 percent slopes, severely eroded.	Well-drained silt loam, about ½ foot to 1½ feet thick, over 1½ to 2½ feet of silty clay loam or heavy silt loam; underlain by 10 to 20 feet of silt loam or silt; seasonally high water table at a depth of 10 to 20 feet or more.	0 to 3 3 to 26 26 to 72	Silt loam. Heavy silt loam. Silt loam (Natchez)
MnE3	Memphis and Natchez silt loams, 12 to 17 percent slopes, severely eroded.			
MnF2	Memphis and Natchez silt loams, 17 to 40 percent slopes, eroded.			

See footnote at end of table.

estimated physical and chemical properties—Continued

Classification—Con.		Percentage passing sieve—			Permeability	Available water capacity	Reaction	Salinity	Dispersion	Shrink-swell potential
Unified	AASHO	No. 4 (4.76 mm.)	No. 10 (2.0 mm)	No. 200 (0.074 mm.)						
					In. per hr.	In. per in. of soil	pH			
ML or ML-CL	A-4 or A-6		100	97	0.8 to 2.5	0.25 to 0.28	5.0 to 6.5	None	High	Low to moderate.
ML-CL	A-4.		100	99	0.8 to 2.5	0.24	5.0 to 6.0	None.	High.	Low
ML-CL	A-6.		100	98	0.8 to 2.5	0.25	5.0 to 5.5	None.	Moderate.	Moderate.
ML-CL	A-4.		100	99	0.8 to 2.5	0.19	5.0 to 5.5	None	High.	Low
ML-CL	A-4.			100	0.8 to 2.5	0.24	5.0 to 5.5	None	High.	Low
ML-CL	A-6			100	0.8 to 2.5	0.33	4.5 to 5.0	None	Moderate.	Moderate
ML-CL	A-4			100	0.0 to 0.2	(1)	4.5 to 5.0	None.	Moderate to high.	Low
ML-CL or ML-CL	A-4 or A-6.		100	98	0.8 to 2.5	0.20 to 0.30	5.5 to 8.0	None.	High to moderate	Low to moderate
ML-CL	A-4		100	97	0.8 to 2.5	0.24	4.5 to 6.0	None.	High.	Low
ML-CL	A-		100	98	0.2 to 0.8	0.28	4.5 to 6.0	None.	Moderate.	Moderate.
ML-CL	A-6.		100	99	0.0 to 0.02	(1)	4.5 to 6.5	None.	Moderate to high.	Low
ML-CL	A-4		100	99	0.0 to 0.05	(1)	4.5 to 7.3	None.	Moderate to high.	Low
ML-CL	A-4.			100	0.8 to 2.5	0.25	5.0 to 5.5	None.	High.	Low
ML-CL or CL	A-6 or A-7			100	0.8 to 2.5	0.30	4.5 to 5.5	None.	Moderate.	Moderate.
ML-CL	A-4.			100	0.8 to 2.5	0.23	4.5 to 6.5	None.	High.	Low
ML-CL	A-4			100	0.8 to 2.5	0.25	5.0 to 5.5	None.	High.	Low
ML-CL or CL	A-6 or A-7			100	0.8 to 2.5	0.30	4.5 to 5.5	None	Moderate	Moderate.
ML-CL.	A-			100	0.8 to 2.5	0.10 to 0.23	4.5 to 6.5	None.	High.	Low
ML-CL	A-4.		100	100	0.8 to 2.5	0.25	5.5 to 6.5	None	High	Low
ML-CL	A-6.		100	95 to 100	0.8 to 2.5	0.30	5.5 to 7.0	None	High	Low
ML-CL or ML	A-4		100	95 to 100	0.8 to 2.5	0.24	5.5 to 8.0	None	High	Low

TABLE 9.—*Brief description of soils and their*

Map symbol	Soil	Description of soil and site	Depth from surface	Classification: USDA textural class
			In.	
M	Morganfield silt loam.	Well-drained alluvial silt loam, about 4 to 6 feet thick; seasonally high water table at a depth of 2½ to 4 feet.	0 to 50	Silt loam.
Ro	Robinsonville loam.	Well-drained, stratified, medium- and coarse-textured Mississippi River alluvium; seasonally high water table at a depth of 2½ to 4 feet.	0 to 6	Loam.
			6 to 40	Fine sandy loam.
			40 to 46+	Loamy sand.
Sc	Sharkey clay.	Poorly drained silty clay or clay, about ½ foot thick, over 3 feet or more of massive clay; seasonally high water table at the surface.	0 to 5	Clay or silty clay.
			5 to 40+	Clay.
Sd	Sharkey, Tunica, and Dowling clays.	Poorly drained and somewhat poorly drained, clayey Mississippi River alluvium; some areas are stratified with sandy loam, loam, and silt loam about 2 feet below the surface.	0 to 24	Clay.
			24 to 48	Variable: clay to sandy loam.
SsC SsF	Silty land, rolling. Silty land, steep.	Well-drained silt, silt loam, or silty clay loam; where used for building sites and parks several feet of profile have been greatly altered.	0 to 48+	Silt to silty clay loam.
Sw	Swamp.	Very poorly drained alluvium that is inundated most of the year.		
Tu	Tunica silty clay.	Somewhat poorly drained, clayey Mississippi River alluvium underlain by sandy loam, loam, and silt loam at a depth of about 1½ to 2½ feet; seasonally high water table at a depth of ½ foot to 1½ feet.	0 to 4	Silty clay.
			4 to 24	Clay.
			24 to 40	Silt loam.
Wa	Wakeland silt loam.	Somewhat poorly drained, friable, alluvial silt loam, about 4 to 6 feet thick; seasonally high water table at a depth of ½ foot to 1½ feet.	0 to 52	Silt loam.
Wo	Wakeland silt loam, local alluvium.	Somewhat poorly drained alluvial silt loam, about 1½ to 2½ feet thick, over 2 to 3 feet of silty clay loam or heavy silt loam; seasonally high water table at a depth of ½ foot to 1½ feet.	0 to 24	Silt loam.
			24 to 48	Silty clay loam.
			48+	Silt loam.
Wf	Waverly and Falaya silt loams (Waverly portion).	Poorly and somewhat poorly drained alluvial silt loam, about 4 to 6 feet or more deep; seasonally high water table at a depth of about 0 to 1½ feet.	0 to 8	Silt loam.
			8 to 30+	Heavy silt loam.

Compact fragipan restricts roots; water not available to plants.

gravel (single-grain structure), soils having small amounts of nonplastic to slightly plastic fines, and most other nonplastic to slightly plastic soil material have a low shrink-swell potential. For example, the Sharkey soils, which are high in montmorillonite clay, are very sticky when wet and develop extensive shrinkage cracks when dry; hence, these soils have a very high shrink-swell potential. On the other hand, the subsoil of Crevasse fine sandy loam is structureless (single grained) and nonplastic; hence, it has a low shrink-swell potential.

Interpretation of engineering properties of soils

Table 10 rates the soils as sources of construction material and lists the properties that affect the suitability of the soils for specified engineering uses. The information in this table is useful in developing design recommendations.

Engineering problems by physiographic areas

The soils of Warren County formed in loess and alluvium. So that engineering problems can be discussed more readily, the county may be divided into two parts: (1) the alluvial plain of the Mississippi River and (2) the loess hills. The general soil map at the back of this report shows these general areas and their location in the county.

The alluvial plain of the Mississippi River is a broad, nearly level area of alluvium. It consists of natural levees and slack-water areas. Depressions that were formerly stream channels occur in both parts of this area. In places

estimated physical and chemical properties—Continued

Classification—Con. Unified	AASHO	Percentage passing sieve— No. 4 (4.76 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)	Permeability	Available water capacity	Reaction	Salinity	Dispersion	Shrink-swell potential
					In. per hr.	*In. per in. of soil*	*pH*			
ML or ML-CL	A-4 or A-6		100	99	0.8 to 2.5	0.20 to 0.25	6.5 to 7.5	None	High	Low.
ML-CL or CL	A-4 or A-6		100	75	0.8 to 2.5	0.16	6.5 to 7.5	None	High	Low.
ML-CL	A-4		100	60	0.8 to 2.5	0.14	6.5 to 7.5	None	High	Low.
SM	A-2		100	15	0.8 to 2.5	0.08	6.5 to 7.5	None	High.	Low.
CH	A-7		100	97	0 to 0.05	0.25	5.5 to 7.5	None	Low	High.
CH	A-7		100	97	0 to 0.05	0.25	6.0 to 7.5	None	Low	High.
CH	A-7		100	97	0 to 0.05	0.25	6.0 to 7.5	None	Low	High.
Variable CH to SM	Variable A-7 to A-2		100	35 to 100	0 to 2.5	0.8 to 0.25	6.0 to 8.0	None	Low to high	High to low.
ML-CL	A-4 or A-6		100	98	0.8 to 2.5	0.24 to 0.30	5.5 to 8.0	None	High.	Low to moderate.
CH	A-7		100	97	0.05 to 0.8	0.27	6.0 to 7.5	None.	Low	High.
CH	A-7		100	100	0 to 0.05	0.25	6.5 to 7.5	None	Low	High.
ML-CL	A-4		100	95	0.8 to 2.5	0.18	6.5 to 7.5	None	Moderate.	Moderate to low.
ML or ML-CL	A-4 or A-6.		100	80	0.8 to 2.5	0.25 to 0.28	6.5 to 7.5	None	High.	Low.
ML-CL	A-4		100	80	0.8 to 2.5	0.20	6.5 to 7.5	None	High	Low.
ML-CL	A-6			100	0.8 to 2.5	0.30	6.6 to 7.5	None	Moderate	Moderate.
ML-CL	A-4			100	0.8 to 2.5	0.26	6.5 to 7.5	None.	Moderate.	Low.
ML-CL	A-4		100	99	0.8 to 2.5	0.26	5.5 to 6.5	None.	High	Low.
ML-CL	A-6		100	98	---	---	5.5 to 6.5	None.	High to moderate.	Low to moderate.

the layer of sediments is more than 100 feet thick. From December to April, the rainfall is at a rate of 5 to 6 inches per month, and the water table is at its highest level for the year. Consequently, earthwork is possible only in summer and fall.

On the natural levees are the Commerce, Robinsonville, and Crevasse soils. On these soils drainage ranges from excessive to somewhat poor, the shrink-swell potential is moderate to low, permeability is moderate to very rapid, and the dispersion rate is generally high. Many of these areas are subject to overflow and backwater. They may contain good sources of sand and fill material.

In the slack-water areas are the Sharkey, Tunica, Dowling, and Alligator soils. These soils are poorly drained. They are high in montmorillonite clay and, consequently, have a very high shrink-swell potential. They are very sticky when wet. Permeability is very slow, and the dispersion rate is low. Many of the areas are subject to overflow and backwater. Local areas may be ponded much of the year. These soils need special preparation for road beds and building sites. They are not suitable for road subgrade, because the contraction and expansion causes the pavement to warp and crack. Cracking and warping can be minimized by using a thick layer of soil that shrinks and swells very little as a foundation course beneath the pavement. The foundation course should extend through the shoulder of the road.

TABLE 10.—*Interpretation of*

Soil series and map symbols	Suitability as a source of— Topsoil	Sand	Suitability as material for road fill	Factors that may affect engineering practices— Highway location	Dikes or levees	Farm ponds: Reservoirs
Adler (Ad, Am)	Fair to good.	Not suitable.	Fair, easily eroded [1]	Occasional floods; soil properties fair.	Poor to fair stability; low shrink-swell potential.	Floods; slow seepage.
Alligator (Al)	Poor	Not suitable.	Poor; cracks when dry.	Highly plastic material; high shrink-swell potential; backwater.	Fair stability; high shrink-swell potential.	Impervious; will support deep water.
Bowdre (Bo)	Poor	Not suitable	Poor to fair; cracks when dry.	High water table; stratified with highly plastic material.	Fair to good stability; stratified material.	Moderate to slow seepage.
Calloway (Ca)	Poor to fair	Not suitable	Fair, easily eroded.	High water table; fragipan impedes internal drainage.	Poor to fair stability; low shrink-swell potential.	Slow seepage.
Collins (Cc, Cn)	Poor	Not suitable	Fair, easily eroded [1]	Occasional floods; soil properties fair.	Poor to fair stability; low shrink-swell potential.	Slow seepage.
Commerce (Cm, Co, Cp)	Fair	Not suitable to fair	Fair to good; easily eroded.	Soil properties good; high water table.	Fair to good stability; stratified material.	Slow to moderate seepage.
Commerce, Robinsonville, and Crevasse (Crc)	Fair	Poor to good.	Fair to good; fair stability [2]	Frequent floods and backwater.	Variable.	Moderate to rapid seepage.
Crevasse (Cy)	Fair	Good.	Fair to good; good stability.[2]	Soil properties good.	Good stability; low shrink-swell potential.	Rapid seepage.
Dowling (Do)	Poor	Not suitable.	Poor; cracks when dry.	High shrink-swell potential; frequent floods and backwater.	Poor stability; high shrink-swell potential.	Slow seepage.
Falaya (Fa, Fl)	Fair to good.	Not suitable.	Fair, easily eroded.	Frequent floods; soil properties fair.	Poor to fair stability; low shrink-swell potential.	Slow seepage.
Grenada (GrA, GrB, GrB2, GrC3)	Poor to fair	Not suitable	Fair, easily eroded.[1]	Fragipan impedes internal drainage; easily eroded.	Poor to fair stability; low to moderate shrink-swell potential.	Slow seepage.
Gullied land (Gu)	Poor	Not suitable.	Fair; easily eroded.	Highly erodible; soil properties fair.	Low to moderate shrink-swell potential.	Slow seepage.

See footnotes at end of table.

engineering properties of soils

Factors that may affect engineering practices—Continued

Farm ponds: Embankments	Agricultural drainage	Irrigation	Terraces and diversions	Waterways	Suitability for septic tanks
Easily eroded; needs to be vegetated immediately.	Moderately permeable; needs surface drainage.	High water-holding capacity; slow intake.	Soil properties favorable; no limitations.	High water-holding capacity; moderate fertility.	Poor; occasional floods.
High shrink-swell potential; cracks when dry.	Very slowly permeable; seasonally high water table; needs surface drainage.	Cracks when dry; high water-holding capacity; very good initial intake when cracked, decreasing as soil becomes moist.	Not needed because of topography.	High available water capacity; high fertility.	Poor or not suitable; dense plastic clay.
Stratified material; low to high shrink-swell potential.	Moderately to slowly permeable; needs surface drainage.	Cracks when dry; high water-holding capacity; very rapid initial intake when cracked, decreasing as soil becomes moist.	Not needed because of topography.	High available water capacity; high fertility.	Fair to poor; high water table.
Easily eroded; needs to be vegetated immediately.	Perched water table; needs surface drainage.	Slow intake; shallow root zone.	Soil properties favorable; no limitations.	Low water-holding capacity; shallow root zone.	Poor or not suitable; fragipan.
Easily eroded; needs to be vegetated immediately.	Moderately permeable; needs surface drainage.	High water-holding capacity; slow intake.	Soil properties favorable; no limitations.	High water-holding capacity; moderate fertility.	Poor; occasional floods.
Easily eroded; needs to be vegetated immediately.	Moderately permeable; needs surface drainage.	High water-holding capacity; slow to moderate intake.	Not needed.	High water-holding capacity; high fertility.	Fair to poor; stratified materials.
Variable.	Frequent floods and backwater.	Variable water-holding capacity; variable intake.	Not needed.	Variable.	Poor; frequent floods.
Low content of silt and clay; rapid permeability; good structure and stability.	Not needed.	Low water-holding capacity; rapid intake.	Not needed.	Low water-holding capacity; low fertility.	Good; high permeability; some danger of contaminating nearby streams, lakes, and wells.
High shrink-swell potential; cracks when dry.	Topography makes drainage difficult.	Cracks when dry; high water-holding capacity; rapid initial intake when cracked, decreasing as soil becomes moist.	Not needed.	High water-holding capacity; low fertility.	Poor or not suitable; dense plastic clay in depressions.
Poor stability; low shrink-swell potential.	Moderately permeable; high water table; needs surface drainage.	High water-holding capacity; slow intake.	Soil properties favorable; no limitations.	High water-holding capacity; moderate fertility.	Poor or not suitable; frequent floods.
Poor to fair stability; low to moderate shrink-swell potential.	Perched water table; needs surface drainage.	Moderate water-holding capacity; slow intake.	Soil properties favorable; no limitations.	Fragipan limits root zone and water-holding capacity.	Poor; fragipan impedes internal drainage.
Easily eroded; needs to be vegetated immediately.	Nonagricultural land.	High water-holding capacity; slow intake.	Highly erodible.	High water-holding capacity; moderate fertility.	Fair; erodible and steep.

TABLE 10.—*Interpretation of engineering*

Soil series and map symbols	Suitability as a source of— Topsoil	Suitability as a source of— Sand	Suitability as material for road fill	Factors that may affect engineering practices— Highway location	Factors that may affect engineering practices— Dikes or levees	Factors that may affect engineering practices— Farm ponds: Reservoirs
Henry (He)	Poor	Not suitable	Fair; easily eroded.[1]	High water table; fragipan impedes internal drainage.	Poor to fair stability; low to moderate shrink-swell potential.	Slow seepage.
Memphis (MeA, MeB, MeB2, MeB3, MeC2, MeC3)	Fair to good.	Not suitable	Fair; easily eroded.[1]	Slopes easily eroded; soil properties fair.	Poor to fair stability; low to moderate shrink-swell potential.	Slow seepage.
Memphis and Loring (MlA, MlB, MlB2, MlB3, MlC2, MlC3)	Fair to good.	Not suitable.	Fair; easily eroded.[1]	Slopes easily eroded; soil properties fair.	Poor to fair stability; low to moderate shrink-swell potential.	Slow seepage.
Memphis and Natchez (MnD3, MnE3, MnF2)	Fair to good.	Not suitable	Fair; easily eroded.[1]	Slopes easily eroded.	Poor to fair stability; low to moderate shrink-swell potential.	Slow seepage.
Morganfield (M)	Fair to good.	Not suitable	Fair; easily eroded.[1]	Occasional floods; soil properties fair.	Poor to fair stability; low shrink-swell potential.	Slow seepage.
Robinsonville (Ro)	Fair to good.	Poor to fair.	Good; fair stability.[2]	Soil properties good.	Good stability; low shrink-swell potential.	Moderate to rapid seepage.
Sharkey (Sh)	Poor	Not suitable.	Poor; cracks when dry.	Highly plastic soil material; high shrink-swell potential.	Fair stability; high shrink-swell potential.	Impervious; will support deep water.
Sharkey, Tunica, and Bowling (Sd)	Poor	Not suitable.	Poor; cracks when dry.	Frequent floods.	Fair stability; high shrink-swell potential.	Impervious; will support deep water.
Silty land (SsC, SsF)	Poor	Not suitable.	Fair; easily eroded.[1]	Slopes easily eroded.	Poor to fair stability; low to moderate shrink-swell potential.	Slow seepage.
Swamp (Sw)	Fair to good.	Not suitable.	Not suitable to fair; may contain organic matter.	Flooded much of the time.	Variable.	Slow seepage.
Tunica (Tu)	Poor	Not suitable	Good below plastic clay.	20 to 30 inches of plastic clay over friable material.	Fair to good stability; high shrink-swell potential (10 to 30 inches).	Slow to moderate seepage.

See footnotes at end of table.

properties of soils—Continued

Factors that may affect engineering practices—Continued

Farm ponds—Con. Embankments	Agricultural drainage	Irrigation	Terraces and diversions	Waterways	Suitability for septic tanks
Easily eroded; needs to be vegetated immediately.	Areas are depressed; subsurface drainage difficult.	Low water-holding capacity; very slow intake.	Soil properties favorable; no limitation.	Low water-holding capacity; low fertility.	Poor or not suitable; perched water table.
Poor to fair strength and stability; easily eroded; needs to be vegetated immediately.	Surface drainage needed on level topography; moderately permeable.	High water-holding capacity; slow intake.	Soil properties favorable; no limitation.	High water-holding capacity; moderate fertility.	Fair to good; well-drained uplands; moderate internal drainage.
Poor to fair strength and stability; easily eroded; needs to be vegetated immediately.	Surface drainage needed on level topography; moderately permeable.	High water-holding capacity; slow intake.	Soil properties favorable; no limitation.	High water-holding capacity; moderate fertility.	Fair to good; moderate internal drainage.
Poor to fair strength and stability.	Not needed.	High water-holding capacity; slow intake.	Steep; easily eroded.	High water-holding capacity; moderate fertility.	Fair to good; moderate internal drainage.
Poor strength and stability; easily eroded; needs to be vegetated immediately.	Needs surface drainage; moderately permeable.	High water-holding capacity; slow intake.	Soil properties favorable; no limitation.	High water-holding capacity; moderate fertility.	Poor; occasional or frequent floods.
Good strength and stability; low in silt and clay; moderate seepage rate.	Needs surface drainage; moderately or rapidly permeable.	Moderate water-holding capacity; moderate intake.	Not needed because of topography.	Moderate water-holding capacity; high fertility.	Good; moderate internal drainage.
High shrink-swell potential; cracks when dry.	Needs surface drainage; very slowly permeable; high water table.	High water-holding capacity; cracks when dry; very rapid initial intake, decreasing as soil becomes moist.	Not needed because of topography.	High water-holding capacity; high fertility.	Poor or not suitable; dense plastic clay.
High shrink-swell potential; cracks when dry.	Very slowly permeable; high water table.	High water-holding capacity.	Not needed because of topography.	High water-holding capacity; high fertility.	Poor or not suitable; dense plastic clay.
Poor to fair strength and stability; easily eroded; needs to be vegetated immediately.	Not needed.	High water-holding capacity; slow intake.	Easily eroded on steep slopes.	High water-holding capacity; moderate fertility.	Fair to good; moderate internal drainage.
Variable.	Outlets difficult to find; subsurface drainage difficult.		Variable.	Variable.	Poor or not suitable; very poorly drained.
Poor to fair strength; upper 20 to 30 inches cracks when dry.	Needs surface drainage; slowly permeable in upper 20 to 30 inches.	High water-holding capacity; slow intake.	Not needed because of topography.	High water-holding capacity; high fertility.	Poor to fair; plastic clay subsoil; moderately permeable.

TABLE 10.—*Interpretation of engineering*

Soil series and map symbols	Suitability as a source of—			Factors that may affect engineering practices—		
	Topsoil	Sand	Suitability as material for road fill	Highway location	Dikes or levees	Farm ponds: Reservoirs
Wakeland (Wa) [illegible]	Fair to good	Not suitable	Fair; easily eroded	Occasional floods [illegible]	Poor to fair [illegible] potential	Slow seepage
Wa[illegible] and Falaya (Wf)	Fair to good.	Not suitable	Fair; easily eroded.	Frequent floods	Poor to fair stability; low to [illegible]	Slow seepage

[1] These soils should be treated with hydrated lime when used for roadway subbases

The western edge of the loess hills consists of steep hills and bluffs that rise abruptly from the Mississippi River alluvial plain to a height of 75 to 125 feet. To the east, the uplands, marked with minor bluffs and escarpments, slope gradually to the Big Black River. The predominant soils in [illegible] area are [illegible] well drained Memphis and Natchez soils of the uplands and the moderately well drained Adler soils of the stream bottoms. The minor soils of the uplands are the Loring, Grenada, Calloway, and [illegible], all of which have a fragipan. The fragipan impedes vertical drainage and causes a perched water table. [illegible] of the stream bottoms are the Falaya, Wakeland, and Waverly, which are somewhat poorly drained and poorly drained and have a seasonally high water table 18 inches below the surface.

The soils of the loess hills generally have a low to moderate shrink-swell potential, moderate or moderately slow permeability, and a moderate to high dispersion rate. Drainage ranges from good to poor.

Construction work generally is discontinued from December to April, because of rain. Erosion is likely. The loessal soils on the bottom lands and those that have a fragipan need special preparation if used as roadbeds. If the fragipan is close to the surface, it should be excavated and [illegible]. If the fragipan is below the roadbed, underdrains between the fragipan and the roadbed may be adequate.

The back slopes of road cuts in undisturbed loessal soils are less likely to slump and slide if they are vertical than if they are sloped. The slopes of loessal fills should be less steep than the back slopes of cuts in undisturbed loess. It [illegible] from erosion. All ditches and gutters require protection by sod, pavement, or check dams.

Conservation engineering

This subsection explains the methods now used in the [illegible] for [illegible] and leveling [illegible]. In planning drainage, irrigation, or leveling, it will be helpful [illegible] information given [illegible]

DRAINAGE.—A good drainage system is essential if the farmlands of Warren County are to be used efficiently. M[illegible] has been done to improve drainage, but [illegible] improvements are needed.

Outlets.—Adequate outlets are essential to good drainage. The [illegible] should provide ample outlets, but natural levees have built up until some streambanks are higher than surrounding [illegible] are choked with brush and vegetation. To provide drainage outlets, drag [illegible] streams and bayous, and the streams and bayous should be cleared of brush and vegetation. In many places this has already been done.

Secondary drainage ditches.—These ditches generally are [illegible] feet and [illegible]. One [illegible] of this type commonly provides drainage for several farms.

V-type and W-type ditches.—These ditches serve as field drains and carry water from the rows to the secondary drainage [illegible]. As the name [illegible] slopes and, consequently, if fairly deep, is relatively wide [illegible] generally designed to remove from [illegible] 3 inches of water in 24 hours. A ditch of this type is easy to maintain, and it can be crossed by farm machinery or used as a place to turn farm machinery. Water [illegible] drain easily from the rows into a V-type ditch unless the soil is leveled or special inlets are made.

A W-type ditch is built by moving the spoil from two [illegible] toward the center of the area between the ditches, so that it forms a ridge. Water from the rows can drain easily into either of the two ditches. The raised center can be cultivated, or it can be used as a road or turnrow.

Graded rows (row arrangement).—The arrangement of rows is important in providing drainage on farms. The grade of the rows should be just enough so that excess [illegible]

properties of soils—Continued

Factors [illegible] may affect engineering practices—Continued

Farm ponds—Continued: Embankments	Agricultural drainage	Irrigation	Terraces and diversions	Waterways	Suitability for septic tanks
Poor to fair strength and stability; easily [illegible] be vegetated immediately	Surface drainage [illegible]	High water-holding capacity; slow [illegible]	Soil properties favorable; no limitation.	High water-holding capacity; moderate fertility.	Poor; occasional to frequent floods.
[illegible] eroded; needs to [illegible]	Outlets difficult to find; subsurface drainage difficult; frequent floods	High water-holding [illegible]	Soil properties favorable; [illegible]	High water-holding capacity; moderate fertility.	Poor or not suitable; floods of long duration

[1] These soils may be treated with portland cement and used for roadway bases

most [illegible] the best grade [illegible] of a foot [illegible] feet [illegible] grade are [illegible] at right angles [illegible] tributed. Much of the rain falls in winter. From June [illegible] growth of plants.

[illegible]

[illegible] Warren County [illegible] the graded furrow [illegible]

The sprinkler method.—The sprinkler method consists of spraying water [illegible]

The graded furrow method.—This method consists of releasing water [illegible] furrows between [illegible] the furrows by gravity and seeps [illegible] vances. This method is suitable for medium textured to moderately fine textured soils. It also works well on fine textured soils that crack when dry, but only after the [illegible]

The graded furrow method generally requires less labor [illegible] able only for properly graded soils that have a uniform surface. Preparation for this type of irrigation ranges from minor smoothing to complete leveling.

The contour border method.—This method consists of applying water [illegible] faster than [illegible] absorbed. The water spreads over the area and is retained [illegible] depth. The water that has not been absorbed is then released and drains off onto a lower area. This method requires little labor, and it is efficient in the use of water. It can be used on slopes to better advantage than the furrow method, [illegible] the other two methods. Pasture grasses, hay, and rice are [illegible] crops also do well. If row crops are grown, the levee [illegible]

LEVELING.—Land is leveled to provide better surface drainage, to increase the efficiency of irrigation, and to prepare for the use of mechanized equipment. Three degrees of leveling are in general use—smoothing, rough grading, and leveling.

Smoothing.—This consists of removing minor surface irregularities without altering the general topographic pattern. Many of the irregularities are so slight that they are not apparent to the eye. Landplanes, levelers, or floats are used for smoothing.

Rough grading.—This consists of removing greater irregularities—knolls, mounds, or ridges—and filling in the pockets and low areas. The cuts are deeper than in smoothing, commonly amounting to more than 2 feet. Large earth-moving equipment is required. Rough grading generally is followed by smoothing.

Leveling to an established grade.—This consists of grad- [illegible] The planes may be level, but they generally are made to [illegible] right angles to the rows. A topographic map and a grad- [illegible] is used as for smoothing and rough grading. Fields that are to be irrigated are leveled enough to permit the efficient use of water.

Sanitary engineering

Only the urban area of Warren County is served by a sanitary sewerage system. In the rest of the county, septic tanks and other means of sewage disposal are required. [illegible] survey report can be used to help locate soils that [illegible] cause disposal fields to fail.

In the last column of table 10, the soils are rated as to suitability for location of septic tanks and disposal fields. The ratings are based on estimates and measurements of soil permeability and on a limited amount of test data obtained by the percolation test procedures outlined in the Manual of Septic Tank Practice issued by the Public Health Service (*10*). Other factors considered were the duration and frequency of flooding and the level of the water table.

Ponds

Warren County is well supplied with sites suitable for farm ponds, and a large number of ponds have been built. These ponds are a major source of water for livestock, and a few of them are used to supply water for supplemental irrigation of crops. Most ponds are stocked with fish. [illegible] struct because seepage is not a problem, except in a few [illegible]

In constructing farm ponds, it is important to (1) select [illegible] imum cost, (2) prevent seepage under or through the dam [illegible] use of suitable fill material, (3) provide emergency spillways to carry off surplus storm water, and (4) sod the dam and spillways to prevent erosion.

Table 10 gives some of the properties that affect the suitability of soils for farm ponds.

Genesis, Morphology, and Classification of Soils

The factors that have affected the formation and development of the soils in Warren County are discussed in this section, and the soils are classified by higher categories.

Factors of Soil Formation

Soil is a function of climate, living organisms, parent materials, topography, and time. The nature of the soil at any point on the earth depends upon the combination of the five major factors at that point. All five of these factors come into play in the genesis of every soil. The relative importance of each differs from place to place; sometimes one is more important and sometimes another. In extreme cases one factor may dominate in the formation of the soil and fix most of its properties, as is common when the parent material consists of pure quartz sand. [illegible] from it usually have faint horizons. Even in quartz sand, however, distinct profiles can be formed under certain types of vegetation where the topography is low and flat and the water table is high. Thus, for every soil, the past combination of the five major factors is of the first importance to its present character.

Parent material

Parent material is the unconsolidated mass from which a soil develops. It is largely responsible for the chemical and mineralogical composition of soils.

In Warren County there are two kinds of parent material. Loess is the parent material of the upland soils, and alluvium is the parent material of the soils in the delta.

The loess was deposited in Warren County approx- [illegible] ments that were carried into the flood plain of the Mississippi River (*11*). The prevailing westerly winds picked up the silt and deposited it on the hills to the east. This mantle of silt has covered the underlying Coastal Plain [illegible] bluffs in the western part of the county. It is about 20 feet thick in the eastern part of the county.

The soils along the streams in the loess hills and along the Big Black River in the eastern part of the county formed in alluvium washed from the loessal uplands. The soils on the first bottoms are weakly developed and are still receiving deposits.

[illegible] formed largely in alluvium deposited by the Mississippi River. In addition, alluvium has been brought down from the uplands by the Yazoo and Big Black Rivers. Small local streams originating in the loessal bluffs, which mark the edges of the uplands, have deposited silty alluvium in the delta. These deposits are generally confined to bands adjacent to the bluffs and are not more than 1 or 2 miles in width. The total thickness of the alluvium is more than 100 feet.

The alluvium in Warren County has a mixed lithology, originating as it does in the wide reaches of the upper Mississippi River basin. Sedimentary rocks are most extensive in this upper basin, which extends from Montana to Pennsylvania, but other kinds of rock are also exposed and serve as sediment sources in many places. Immense areas in the upper basin are mantled by recent glacial drift and loess. The alluvium along the lower stretches of the Mississippi including Warren County has come from the multitude of soils, rocks, and unconsolidated sediments of some 20 States. As a result, the alluvium consists of a mixture of minerals. Furthermore, many of the minerals are comparatively fresh and but slightly weathered.

Within Warren County, there are wide ranges in the texture of the alluvium because of differences in deposition. When the river overflows its channel and the water spreads [illegible] first. Sands are commonly deposited in bands parallel to

[illegible] as natural levees. As the floodwaters continue to spread [illegible] are deposited next, usually in mixture with some sands and clays. When the flood has passed and water is left standing in the lowest parts of the flood plain, the finest sediments, or clays, may settle out. These so-called slack-water clays do not settle until the water becomes still [illegible] some differences in chemical and mineralogical com- [illegible] they are lower in feldspars and ferromagnesian minerals [illegible] distinctly calcareous, whereas many of the slack-water sediments are free of carbonates and are slightly acid.

Climate

Climate as a genetic factor affects the physical, chemical, and biological relationships in the soil primarily through the influence of precipitation and temperature. Water dissolves minerals, supports biological activity, and transports mineral and organic residues through the soil profile. The amount of water that actually percolates through the soil over a broad area depends mainly upon rainfall, relative humidity, and the length of the frost-free periods. [illegible] so affected by physiographic position and by soil per- [illegible] growth of organisms and the speed of physical and chem- [illegible] characteristics of the soils to differ from those developed under the prevailing macroclimate.

The present climate of Warren County generally is hot and humid. Summer temperatures are high; an average of 95 days have temperatures of 90 degrees or higher. Humidity usually is high during the summer. Winter weather generally begins in late November and lasts through February. Even in winter the average monthly temperature remains above freezing. The average daily minimum in January, the coldest month, is 37.6 degrees (see table 13). During the winter, extreme ranges in temperature are common.

Rainfall is around 50 inches per year. It is [illegible] gust, September, and October, and 2 to 2.5 inches during [illegible] opes and on the steeper slopes which are protected by vegetation, rainfall is sufficient to keep the soils moist to wet much of the time from November through May, and leaching, therefore, is an important soil-forming process. The soils are moist to moderately dry from June through October. Rainfall is an important factor in causing destruction of the soils by sheet and gully erosion. Leaching is not so effective on the steeper slopes that are not protected by vegetation.

The high temperatures, limited freezing period, and high rainfall are favorable for soil-forming processes during most of the year.

Plant and animal life

Micro-organisms are indispensable in soil development [illegible] parent material and in decomposing organic matter. The larger plants serve to alter the soil microclimate, to furnish organic matter, and to transfer elements from the subsoil to the surface layer.

[illegible] on and in the soil are determined in large part by the cli- [illegible] age of the soil. Temperature and precipitation in Warren County are very favorable for growth of trees, grasses, crops, and organisms.

Not much is known of the fungi and micro-organisms in the soils of this county except that they are largely confined to the uppermost few inches. Organic matter is added to the soil by the micro-organisms through their action on vegetative residues and the death and decay of the organisms. The activity of earthworms and other small invertebrates is greatest in the A1 horizon, where they carry on a slow but continual cycle of soil mixing.

The native vegetation on the uplands is chiefly southern red oak, white oak, cherrybark oak, hickory, sweetgum, yellow-poplar, and loblolly pine. The trees on the bottom lands are cottonwood, cherrybark oak, Nuttall oak, overcup [illegible] gum, and yellow-poplar. The trees have influenced the [illegible] mixing of the soil horizons. They have taken minerals from the subsoil in their growth cycle and returned the minerals to the A horizon. Considerable mixing of the soil is brought about by tree throw. This results in the lower horizons being mixed with the A horizon, and the [illegible] is an important factor in soil development.

With the development of agriculture in Warren County man has become important to the future direction and rate of formation of the soils. The clearing of the forest, the cultivation of the soils, the introduction of new species of plants, the building of levees for flood protection in the delta, the artificial improvement of natural drainage, and the effects of erosion on sloping land will be reflected in the direction and rates of soil genesis in the future. The complex of living organisms affecting soil genesis in Warren County has been drastically changed as a result of [illegible]

Topography

Topography is determined largely by the underlying formations, the geologic history of the general region, and the effects of dissection by rivers and streams. It influences soil formation through its effects on moisture relations, erosion, temperature, and plant cover. Its influence is modified by the other four factors of soil formation.

The slope range in Warren County is from 0 to 40 [illegible] Grenada, have well-developed profiles if the slope is less than 17 percent. If the slope is more than 17 percent, runoff has caused geological removal of soil about as fast as it has formed. The Natchez and the Memphis soils [illegible] examples. The steeper Memphis soils have less strongly developed profiles than the less strongly sloping. Soils that are poorly drained and somewhat poorly drained, such as the Henry and the Calloway, have formed in the more nearly level areas where runoff is slow. The alluvial soils

are dominantly on slopes of 0 to 2 percent and have weak [illegible] on the higher elevations near the old stream channel, and the more poorly drained soils are on the lower areas.

Elevations in the hill section range from 200 to about 350 feet. Elevations in the delta section range from 60 to 120 feet above sea level. Elevation changes of only a few feet in the delta determine whether the soil is wet most of the time or droughty.

Time

The length of time required for soil development de[illegible] warm regions that have luxuriant vegetation than [illegible] is required if the parent material is coarse textured than [illegible]

Geologically the soils in the delta portion of the coun[illegible] at frequent intervals. Soils along the Mississippi River [illegible] floods by levees, but the central and lower parts of the delta are not protected and receive fresh deposits during periods of flooding.

[illegible] the land surface in the delta arrived during and after the [illegible] moving into the North Central States 11,000 years ago. [illegible] stage (last of the Wisconsin glaciers) in those States show little horizonation other than the downward leaching of carbonates and the accumulation of organic matter in the surface layer. The present surface of the Mankato drift probably has been exposed for 8,000 years. Assuming that rates of horizon differentiation would be as rapid in the alluvium of Warren County as in the Mankato drift, the soils could be somewhat older than those of south central Minnesota.

The loessal parent material of the upland soils is of Wisconsin age and is approximately 25,000 years old. On the smoother slopes and for most of the upland soils, time has been sufficient for formation of mature soils, as evidenced by the accumulation of organic matter in the A1 horizons, the leached A2 horizons, and the accumulation of clay and development of moderate subangular blocky structure in the B horizons. Most of the free carbonates have been leached to a depth of more than 4 feet. Free carbonates have not been leached from the Natchez soils, which are steeper and have been more affected by runoff [illegible]

Classification and Morphology

The system of soil classification used in the United States consists of six categories, one above the other. Be[illegible] order, the suborder, the great soil group, the family, the series, and the type.

There are three soil orders and thousands of soil types. The suborder and family categories have never been fully developed and thus have been little used. Attention has been given largely to the classification of soils into soil [illegible] to the subsequent grouping of series into great soil groups and orders.

Classes in the highest category of the classification [illegible]

Zonal soils have evident, genetically related horizons that reflect the predominant influence of climate and living [illegible] Warren County are those of the Gray-Brown Podzolic group.

Intrazonal soils have evident, genetically related hori[illegible] topography or parent material. This order is represented [illegible] Grumusols, and the Planosols.

Azonal soils lack distinct, genetically related horizons, commonly because of youth, resistant parent material, or steep topography. In Warren County this order is repre[illegible]

There are six great soil groups represented in Warren [illegible] percent of the county; Gray-Brown Podzolic soils intergrading to Planosols, less than 1 percent; Alluvial soils, about 35 percent; Grumusols, 9 percent; Low-Humic Gle[illegible] about 8 percent.

Table 11 lists the soil series by orders and great soil groups and gives some of the distinguishing characteristics [illegible] sented in Warren County is discussed on the following pages.

Gray-Brown Podzolic soils

The Gray-Brown Podzolic group consists of soils that have thin A0 and A1 horizons, a leached A2 horizon, and [illegible]luvial B horizon. These soils formed under deciduous forest in a temperate, moist climate. The Loring, Memphis, Natchez, and Grenada soils are the Gray-Brown Podzolic soils in this county. Where not disturbed, the Memphis and Loring soils have a thin surface cover of leaf litter from deciduous trees. The A1 horizon, a thin layer of dark grayish-brown silt loam, has weak, fine and medium granular structure. The A2 horizon is a leached, brown silt loam that has weak, fine and medium, granular structure. The B horizon is brown to dark-brown silty clay loam that has moderate, fine and medium, subangular blocky structure. The Loring soils have a weak fragipan below a depth of 30 inches. The Natchez soils have weaker profile development than either the Memphis or Loring soils; they have less clay in the B horizon, and they are not leached [illegible] this county is generally more than 35 percent. The dom[illegible] been active in the soil-forming processes, and bases have been removed from the Memphis and Loring soils to the extent that the soils are acid.

Loring Series.—The soils of the Loring series are mod[illegible] thick loess on the uplands. Their slope range is 0 to 8 percent. Their reaction is acid. They have a weak to moderate fragipan at a depth of more than 30 inches.

Table 11.—*Classification, characteristics, and genetic relationships of soils of Warren County*

ZONAL SOILS

Great soil group and soil series	Brief profile description	Position	Drainage class	Slope range	Parent material	Degree of profile development[1]
Gray-Brown Podzolic:						
Representative—				*Percent*		
Loring	Brown or dark-brown acid silt loam over brown or dark-brown silty clay loam; weak fragipan below 30 inches.	Uplands.	Well drained to moderately well drained.	0 to 8	Loess	Strong.
Memphis	Dark grayish-brown, acid silt loam over brown or dark-brown silty clay loam.	Uplands and stream terraces.	Well drained.	0 to 40	Loess	Strong.
Natchez	Dark yellowish-brown, acid silt loam over brown or dark-brown silt loam; moderately alkaline below 26 inches.	Uplands.	Well drained.	8 to 40	Loess	Weak.
With prominent fragipan—						
Grenada	Brown or dark-brown silt loam over brown or dark-brown silty clay loam; mottled silt loam fragipan below 22 inches.	Uplands and stream terraces.	Moderately well drained.	0 to 8	Loess	Strong.

INTRAZONAL SOILS

Great soil group and soil series	Brief profile description	Position	Drainage class	Slope range	Parent material	Degree of profile development[1]
Planosol (with fragipan):						
Representative—						
Calloway	Brown acid silt loam over mottled yellowish-brown, pale-brown, and light brownish-gray heavy silt loam; fragipan of mottled silt loam below a depth of 18 inches.	Uplands and stream terraces.	Somewhat poorly drained.	0 to [illegible]	Loess	Strong.
Henry	Brown acid silt loam over light brownish-gray silt loam mottled with yellowish brown; fragipan of light brownish-gray heavy silt loam mottled with yellowish brown at a depth of about 18 inches.	Uplands and stream terraces.	Poorly drained.	0 to 2	Loess	Moderate.
Low-Humic Gley:						
Waverly	Mottled light brownish-gray and dark yellowish-brown silt loam over light brownish-gray heavy silt loam mottled with brown.	Bottom lands.	Poorly drained.	0 to 2	Alluvium derived from loess.	Weak.
Alligator	Dark-brown, acid clay mottled with yellowish brown over gray clay mottled with brown.	Low bottom lands.	Poorly drained.	0 to 2	Clayey sediments deposited by the Mississippi River and its tributaries.	Weak.
Dowling	Dark-gray, slightly acid to mildly alkaline clay over dark grayish-brown clay mottled with strong brown and gray.	Depressions.	Poorly drained.	0 to 2	Clayey sediments deposited by the Mississippi River and its tributaries.	Weak.
Regosol:						
Crevasse	Very dark grayish-brown, neutral or mildly alkaline fine sandy loam over pale-brown to dark grayish-brown loamy fine sand.	Recent natural levees.	Excessively drained.	0 to 2	Coarse sediments deposited by the Mississippi River.	Weak.
Grumusol intergrade to Low-Humic Gley:						
Sharkey	Dark-gray, slightly acid to mildly alkaline clay over dark-gray clay mottled with brown.	Low bottom lands.	Poorly drained.	0 to 2	Clayey sediments deposited by the Mississippi River and its tributaries.	Weak.

See footnotes at end of table.

TABLE 11.—*Classification, characteristics, and genetic relationships of soils of Warren County*—Continued

AZONAL SOILS

Great soil group and soil series	Brief profile description	Position	Drainage class	Slope range	Parent material	Degree of profile development [2]
Alluvial:				*Percent*		
Adler	Brown, slightly acid to mildly alkaline silt loam over brown or dark-brown silt loam mottled with pale brown and grayish brown below a depth of 18 inches.	Bottom lands	Moderately well drained.	0 to 3	Alluvium derived from loess.	Weak.
Bowdre	Very dark grayish-brown, slightly acid to mildly alkaline silty clay over brown fine sandy loam mottled with grayish brown at a depth of 10 to 20 inches.	Low bottom lands.	Moderately well drained.	0 to 3	Clayey alluvium overlying sandy alluvium deposited by the Mississippi River and its tributaries.	Weak.
Collins	Brown or dark-brown, acid silt loam over brown silt loam mottled with light brownish gray below a depth of 18 inches.	Bottom lands	Moderately well drained.	0 to 3	Alluvium derived from loess.	Weak.
Commerce	Dark grayish-brown, slightly acid to mildly alkaline silt loam, very fine sandy loam, or silty clay loam over mottled grayish-brown, brown, and yellowish-brown silt loam, silty clay loam, or very fine sandy loam.	Recent natural levees.	Somewhat poorly drained to moderately well drained.	0 to 2	Medium-textured and moderately fine textured alluvium deposited by the Mississippi River and its tributaries.	Weak.
Falaya	Brown or dark-brown, acid silt loam over brown silt loam mottled with pale brown and light gray below a depth of 7 inches.	Bottom lands	Somewhat poorly drained.	0 to 3	Alluvium derived from loess.	Weak.
Morganfield	Brown or dark-brown, slightly acid to mildly alkaline silt loam.	Bottom lands	Well drained	0 to 3	Alluvium derived from loess.	Weak.
Robinsonville	Very dark grayish-brown, slightly acid to mildly alkaline loam over dark grayish-brown fine sandy loam.	Recent natural levees.	Well drained	0 to 2	Alluvium from the Mississippi River.	Weak.
Tunica	Very dark grayish-brown, slightly acid to mildly alkaline silty clay over dark-gray clay mottled with yellowish brown; grayish-brown silt loam below a depth of 20 inches.	Low bottom lands.	Somewhat poorly drained.	0 to 2	Clayey sediments from the Mississippi River and its tributaries.	Weak.
Waverly	Dark grayish-brown, slightly acid to mildly alkaline silt loam over brown silt loam mottled with light brownish gray and yellowish brown below a depth of 7 inches.	Bottom lands	Somewhat poorly drained.	0 to 3	Alluvium derived from loess.	Weak.

[1] Descriptions are of profiles not materially affected by accelerated soil erosion.

[2] As measured by the number of important genetic horizons and the degree of contrast between them.

The following profile of Loring silt loam is in a pasture 1 mile south of the intersection of Mississippi Highway 27 and a gravel road (SW¼ sec. 24, T. 15 N., R. 4 E.). The mapping unit is Memphis and Loring silt loams, 2 to 5 percent slopes, severely eroded.

Ap—0 to 3 inches, brown or dark-brown (7.5YR 4/4) heavy silt loam; weak, fine and medium, subangular blocky structure; friable; common fine roots; strongly acid; clear, smooth boundary.

B21t—3 to 16 inches, brown or dark-brown (7.5YR 4/4) silty clay loam; moderate, fine and medium, subangular blocky structure; friable; thin, discontinuous films of clay on most peds; coatings of light brownish-gray (10YR 6/2) silt on peds and in cracks; few fine roots; strongly acid; gradual, smooth boundary.

B22t—16 to 30 inches, brown or dark-brown (7.5YR 4/4) heavy silt loam; moderate, medium and coarse, subangular blocky structure; friable; slightly plastic; few fine, black manganese coatings and concretions; coatings of light brownish-gray (10YR 6/2) silt on some peds and in cracks; few fine roots; strongly acid; clear, smooth boundary.

B3m—30 to 40 inches +, brown or dark-brown (7.5YR 4/4) silt loam; common, fine, faint and distinct mottles of yellowish brown (10YR 5/4) and pale brown (10YR 6/3); moderate, fine and medium, subangular blocky structure; compact and brittle in place; friable when disturbed; common fine voids; coatings of light brownish-gray (10YR 6/2) silt on peds and in fracture lines; common fine concretions of black manganese and few fine and medium, manganese coatings; strongly acid.

Memphis Series.—The soils of the Memphis series are [illegible] drained and acid. They formed in thick loess on the uplands and on old terraces. The slope range is 0 to [illegible]

The following profile of Memphis silt loam, 2 to 5 [illegible] northeast of Vicksburg, NW¼SW¼ sec. 17, T. 17 N., R. 5 W.

[illegible]

very strongly acid; clear, smooth boundary.

B22—23 to 31 inches, brown or dark-brown (7.5YR 4/4) [illegible]

[illegible] stings on ped faces; few fine roots; [illegible] clear, smooth boundary.

[illegible]

Natchez Series.—The soils of the Natchez series are well drained. They formed in thick loess on the uplands. The [illegible]

The following profile of Natchez silt loam is in a wooded area, NW¼NE¼ sec. 2, T. 14 N., R. 3 E. [illegible] Memphis and Natchez silt loams, 17 to 40 percent slopes, eroded.

[illegible] dark yellowish-brown (10YR 4/4) silt loam; weak, fine, granular structure; friable; few fine roots; [illegible]

[illegible]

[illegible] to 72 inches, brown or dark-brown (10YR 4/3) silt loam; [illegible] few fine pieces of snail shells; moderately alkaline.

Grenada Series.—The soils of the Grenada series [illegible] moderately well drained and acid. They formed in thick loess on old high terraces and on the uplands. The slope range is 0 to 8 percent. These soils have a moderate [illegible] strong fragipan, but in other characteristics they are like Gray-Brown Podzolic soils. Thus, they are classified as Gray-Brown Podzolic soils that intergrade toward Planosols.

The following profile of Grenada silt loam, 0 to 2 percent slopes is in a pasture about 10 miles east of Vicksburg, sec. 12, T. 16 N., R. 5 E.

[illegible]

acid; gradual, smooth boundary.

B3m2—30 to 42 inches, mottled yellowish-brown (10YR 5/4) [illegible]

B3m3—42 to 50 inches +, dark-brown (7.5YR 4/4) [illegible] common, fine, distinct mottles of pale brown (10YR 6/3); weak, fine and medium, subangular blocky structure; friable; few, fine, soft, black concretions; strongly acid.

Planosols (with fragipans)

The Planosol group consists of soils that have [illegible] trasting to an adjacent horizon because of high clay content, cementation, or compactness. In the Planosols of Warren County the lower B horizon is dense and brittle, high in silt, low in clay, and high in bulk density. This layer is called a fragipan. It restricts the movement of [illegible] and roots through the profile. The Calloway and Henry soils are representative of the Planosols in this [illegible]

[illegible] somewhat poorly drained and acid. They formed in thick loess on old terraces and on the uplands. The slope range is 0 to 2 percent. These soils have a moderate to strong fragipan at a depth of about 18 inches.

The following profile of Calloway silt loam is about 10 miles east of Vicksburg, sec. 12, T. 16 N., R. 5 E.

Ap—0 to 3 inches, brown (10YR 5/3) silt loam; weak, fine [illegible]

[illegible] smooth boundary.

B21—12 to 18 inches, mottled yellowish-brown (10YR 5/6), pale-brown (10YR 6/3), and light brownish-gray [illegible]

[illegible]

[illegible] silt loam; common, fine, faint mottles of pale brown (10YR 6/3) and light gray (10YR 7/2); moderate, [illegible]

Henry Series.—The soils of the Henry series are poorly [illegible] old high terraces, and occur as areas of 1 to 5 acres on the uplands. Slopes are less than 2 percent. These soils have a moderate to strong fragipan at a depth of about 12 inches.

Although classified as Planosols, the Henry soils have [illegible] surface layer and have gleyed A2 and B horizons. Thus, [illegible]

The following profile of Henry silt loam is in a pasture [illegible]

[illegible]

medium, black and brown concretions; very strongly acid; clear, smooth boundary.

B2g—9 to 12 inches, light brownish-gray (10YR 6/2) [illegible]

[illegible]

silt loam; many, fine and medium, distinct mottles of yellowish brown (10YR 5/6); moderate, fine and [illegible]

ings on ped faces and in cracks; strongly acid; gradual, smooth boundary.

B3mg—22 to 30 inches, mottled pale-brown (10YR 6/3), brown (10YR 5/3), and light brownish-gray (10YR [illegible]

[illegible] yellowish brown (10YR 5/6) and gray to light-gray (10YR 6/1) heavy silt loam; mottles are many, fine [illegible]

Cg—30 to 55 inches +, mottled pale-brown [illegible]

Low-Humic Gley soils

The Low Humic Gley group consists of soils that are poorly drained, have a thin surface layer that is low to [illegible] strongly gleyed B and C horizons that are similar to the surface layer in texture. The Waverly, [illegible], and Dowling soils are representative of the Low Humic Gley soils in this county.

Waverly Series.—The soils of the Waverly series are poorly drained and acid. They formed in silty alluvium washed from the loessal uplands. The slope range is 0 to 2 percent.

The following profile of Waverly silt loam is 25 yards [illegible] R. 6 E.

[illegible]

C1g—4 to 8 inches, mottled light brownish-gray (10YR 6/2 [illegible] tles are many, fine, and distinct; weak, fine, granular structure; friable; few fine roots; common, fine, soft, brown and black concretions; strongly acid; gradual, smooth boundary.

[illegible] silt loam; many, fine, distinct mottles of yellowish brown (10YR 5/6); structureless; friable; few, fine, brown and black concretions; strongly acid; gradual [illegible]

[illegible] 4/8); structureless; friable; common, fine, brown and black concretions; strongly acid.

Alligator Series.—The soils of the Alligator series are poorly drained and acid. They formed on low bottoms in clay sediments derived from the fine-textured alluvium of the Mississippi River and its tributaries.

The following profile of Alligator clay is in a pasture, 100 feet east of Cypress Lake, sec. 11, T. 18 N., R. 4 E.

[illegible] (10YR 5/6) and dark gray (10YR 4/1); weak, fine and medium, granular structure; firm; very plastic [illegible]

[illegible] few fine roots; strongly acid; clear, smooth boundary.

Cig—4 to 30 inches, gray (10YR 5/1) clay; many, fine and [illegible] plastic, very sticky; few fine roots; strongly acid; gradual, smooth boundary.

[illegible]

Dowling Series—The soils of the Dowling series [illegible] alkaline. They formed in depressions on the Mississippi [illegible]

The following profile of Dowling clay is in a wooded area east of Eagle Lake.

[illegible] very sticky, firm; few fine roots; mildly alkaline; clear, smooth boundary.

[illegible]

Regosols

The Regosol group consists of soils in which few [illegible] forming in deep, unconsolidated mineral materials. The Crevasse soils are the only Regosols [illegible]

[illegible] mildly alkaline. They formed on recent natural levees in coarse-textured sediments deposited by the Mississippi River.

[illegible] hayfield on the banks of the Mississippi [illegible] 14 N., R. 2 E.

Ap—0 to 6 inches, very dark grayish-brown (10YR 3/2) [illegible]

[illegible]

Grumusols

The Grumusol group consists of soils that are predominantly montmorillonite clay. These soils lack eluvial and [illegible] ture in the upper horizons, and have a high coefficient [illegible] ing. They shrink and swell markedly with changes [illegible] swelling, the soils crack and materials from upper horizons drop into lower horizons. These soils are churned or mixed continuously, a process that partially offsets the horizon differentiation. Calcium and magnesium are dominant in the exchange complex of these [illegible] Sharkey soils have many of the features of Grumusols. They are recognized as an intergrade to Low Humic Gley [illegible] because they are more poorly drained than the typical Grumusols.

Sharkey Series—The soils of the Sharkey series are poorly drained, clayey, and slightly acid to mildly alka- [illegible] alluvium deposited by the Mississippi River.

The following profile of Sharkey clay is in a hayfield [illegible] of Eagle Lake, NW¼SE¼ sec. 19, T. 17 N., R. 3 E.

[illegible]

Alluvial soils

The Alluvial group consists of wet to very dry soils that [illegible] forming processes have not had time to form distinct horizons. These soils have an A horizon in which there [illegible] zon which has been altered very little. Leaching [illegible] soils. Reduction has taken place in some of the soils, as [illegible]

The Adler, Bowdre, Collins, Commerce, Falaya, Wakeland, Morganfield, Robinsonville, and Tunica are the Alluvial soils in this county. The Morganfield, Adler, and Wakeland soils are slightly acid to mildly alkaline, and the Collins and Falaya soils are acid. All of these soils formed in loess on the alluvial plain. The Robinsonville and Commerce soils are slightly acid to moderately alkaline and formed in friable alluvium deposited by the Mis- [illegible] material deposited by the Mississippi River and [illegible]

Morganfield Series—The soils of the Morganfield series are well drained and slightly acid to mildly alkaline. They formed in silty alluvium washed from the Natchez, Memphis, and other soils of the loessal uplands. They are free of gray mottles to a depth of 30 inches or more.

The following profile of Morganfield silt loam is in a hayfield, NW¼SW¼ sec. 8, T. 7 N., R. 4 W.

[illegible] of pale brown (10YR 6/3); weak, fine [illegible] neutral; abrupt, smooth boundary.

[illegible] brownish-gray (10YR 6/2) or gray [illegible] 5/2) silt loam in old root channels; slightly acid; diffuse, wavy boundary.

[illegible] old root channels and wormholes filled with grayish-brown (10YR 5/2) silt loam; slightly acid.

[illegible] ately well drained and slightly acid to mildly alkaline. They formed in silty alluvium washed from the Memphis, Natchez, and other soils of the loessal uplands. Mottles of pale brown and grayish brown begin at a depth of 18 to 30 inches.

The following profile of Adler silt loam is in a pasture, SW¼NW¼ sec. 19, T. 13 N., R. 5 W.

Ap—0 to 8 inches, brown (10YR 5/3) silt loam; weak, fine and very fine, granular structure; friable; many fine roots; mildly alkaline; clear, smooth boundary.

[illegible]

[illegible] structureless; friable; mildly alkaline; gradual, smooth boundary.

C3—24 to 42 inches, mottled grayish-brown (10YR 5/2), brown (10YR 5/3), and yellowish-brown (10YR 5/6) silt loam; mottles are many, fine and medium, faint [illegible]

Bowdre Series.—The soils of the Bowdre series are moderately well drained and slightly acid to mildly alkaline. They formed in fine-textured sediments deposited by the Mississippi River and its tributaries.

The following profile of Bowdre silty clay is in a wooded area west of the Yazoo River, sec. 20, T. 16 N., R. 3 E.

[illegible] (7.5YR 5/6); massive; firm; very plastic; very [illegible] few fine roots; mildly alkaline; clear, smooth [illegible]

[illegible] brown or dark-brown (10YR 4/3) fine [illegible] few, fine, faint mottles of grayish brown (10YR 5/2); structureless; friable; few fine roots; neutral; clear, smooth boundary.

[illegible] grayish brown (10YR 5/2) and dark yellowish brown (10YR 4/4); structureless; friable; neutral; clear, smooth boundary.

[illegible] dark yellowish brown (10YR 4/4) and grayish brown [illegible]

Collins Series.—The soils of the Collins series are moderately well drained and acid. They formed in silty alluvium washed from soils on the loessal uplands. They are mottled with light brownish gray from a depth of 18 to 30 inches.

The following profile of Collins silt loam is in a pasture ½ mile west of the Big Black River, SE¼ sec. 21, T. 7 N., R. 4 W.

Ap—0 to [illegible] inches, dark [illegible] (10YR 4/3) silt loam; [illegible]

[illegible] less; friable; few fine roots; few silt coatings of light brownish gray (10YR 6/2) on peds; strongly acid; gradual, smooth boundary.

C3—18 to 30 inches, brown (10YR 5/3) silt loam; common, fine and medium, faint mottles of light brownish gray (10YR 6/2) and distinct mottles of brown to dark brown (10YR 4/3); structureless; few fine roots; few fine, soft, brown and black concretions; strongly acid; gradual, smooth boundary.

C4—30 to 48 inches, mottled brown (10YR 5/3), light brownish [illegible] 4/3) silt loam; mottles are many, fine and medium, faint and distinct; structureless; friable; few fine, soft, brown and black concretions; strongly acid.

[illegible] moderately well drained to somewhat poorly drained and [illegible] natural levees in friable sediments deposited by the Mississippi River. In some areas adjacent to the Mississippi River, floods are frequent and fresh sediments are deposited. Other areas are protected by levees and are seldom flooded.

The following profile of Commerce silt loam is in a cultivated area, SE¼NE¼ sec. 11, T. 17 N., R. 2 E.

[illegible] grayish brown (10YR 5/2) [illegible]

C3g—22 to 37 inches, mottled grayish-brown (10YR 5/2) [illegible]

Falaya Series.—The soils of the Falaya series are somewhat poorly drained and acid. They formed in silty alluvium washed from loessal soils on the uplands.

The following profile of Falaya silt loam is in a cultivated area 2 miles southeast of Vicksburg, sec. 31, T. 15 N., R. [illegible]

[illegible] of pale brown (10YR 6/3) and few, fine, distinct mottles of light gray (10YR 7/2); structureless; friable; few fine roots; medium acid; gradual, smooth boundary.

C2g—17 to 40 inches, mottled pale-brown (10YR 6/3), dark [illegible] acid; few, fine, black coatings; gradual, [illegible] boundary.

C3g—40 to 50 inches, mottled grayish-brown (10YR 5/2) and [illegible]

Robinsonville Series.—The soils of the Robinsonville series are well drained and slightly acid to mildly alkaline. They formed on recent natural levees in friable sediments deposited by the Mississippi River. In some areas adjacent to the Mississippi River, floods are frequent and

fresh sediments are deposited. Other areas are protected by levees and are seldom flooded.

The following profile of Robinsonville loam is in a pasture, SW¼SE¼ sec. 2, T. 14 N., R. 2 E.

Ap—0 to 5 inches, very dark grayish-brown (10YR 3/2) loam

clear, smooth boundary

to 40 inches, dark grayish-brown (10YR 4/2) fine

gradual, smooth boundary

C2—40 to 48 inches +, dark grayish-brown (10YR 4/2) loamy sand; few, fine, faint, gray (10YR 5/1 structureless; very friable; mildly alkaline.

what poorly drained and slightly acid to mildly alkaline.

material deposited by the Mississippi River and its tribu

inches.

The following profile of Tunica silty clay is in a culti

Creek, SW¼SW¼ sec. 9, T. 18 N., R. 4 E.

boundary

C1—4 to 10 inches, dark-gray (10YR 4/1) clay; many medium

Wakeland Series.—The soils of the Wakeland series are what poorly drained and slightly acid to mildly alkaline. They formed in silty alluvium washed from upland soils as the Memphis and Natchez.

The following profile of Wakeland silt loam is in a pasture, SW¼SE¼ sec. 14, T. 18 N., R. 4 E.

C3g—24 to 32 inches, mottled grayish-brown (10YR 5/2), brown (10YR 5/3

Interpretation of Laboratory Data

Laboratory data available for two typical loessal soils

and 12. The Memphis profile was sampled in 1956, and

The percentage of clay and silt in the C horizon both soils.

cation-exchange capacity than the Loring soil. In the

zon of the Memphis soil has been leached to a greater ex-

TABLE 12.—*Physical*

[Analyses by the Soil Survey Laboratory, Soil Conservation Service

Soil, location, and survey and laboratory numbers	Horizon	Depth	Particle size distribution			
			Very coarse sand (2–1 mm.)	Coarse sand (1–0.5 mm.)	Medium sand (0.5–0.25 mm.)	Fine sand (0.25–0.10 mm.)
		In.	*Pct.*	*Pct.*	*Pct.*	*Pct.*
Loring silt loam:						
Location.—On State Highway 27, about 8 miles southeast of Vicksburg, center of NE¼SE¼ sec. 10, T. 15 N., R. 4 E., Warren County, Miss. *Survey No.* S59–Miss–75–1–(1 to 8). *Laboratory Nos.* 9921 to 9928.	Ap	0 to 7	[1] 0.1	[1] 0.1	0.1	[1] 0.2
	A3	7 to 10	<.1	[1] .1	[1] .1	[1] .3
	B1	10 to 16	.1	<.1	<.1	[2] .1
	B2	16 to 32	<.1	<.1	<.1	[2] .1
	B3m1	32 to 42	<.1	<.1	<.1	[2] .1
	B3m2	42 to 52	<.1	<.1	<.1	[2] .1
	C1	52 to 72	<.1	<.1	<.1	<.1
	C12	72 to 84	<.1	<.1	<.1	<.1
Memphis silt loam:						
Location.—19 miles northeast of Vicksburg, NW¼SW¼ sec. 17, T. 17 N., R. 5 W., Warren County, Miss. *Survey No.* S59–Miss–75–2–(1 to 9). *Laboratory Nos.* 8970 to 8978.	A1	0 to 3	[2] .2	[2] .3	[2] .2	[2] .5
	A2	3 to 9	[illegible]	<.1	<.1	<.1
	B21	9 to 13	<.1	<.1	<.1	<.1
	B22	13 to 23	<.1	<.1	<.1	<.1
	B23	23 to 31	<.1	<.1	<.1	<.1
	B31	31 to 41	<.1	<.1	<.1	<.1
	B32	41 to 51	<.1	<.1	<.1	<.1
	C11	51 to 67	<.1	<.1	<.1	<.1
	C12	67 to 77	<.1	<.1	<.1	<.1

[1] Many light-brown and dark-brown concretions, possibly iron.
[2] Common light-brown and dark-brown concretions, possibly iron.

TABLE 13.—*Chemical*

[Analyses by the Soil Survey Laboratory, Soil Conservation Service,

Soil, location, and survey and laboratory numbers	Horizon	Depth	Reaction (1:1)	Organic matter		
				Organic carbon	Nitrogen	C/N ratio
		In.	*pH*	*Pct.*	*Pct.*	
Loring silt loam:						
Location.—On State Highway 27, about 8 miles southeast of Vicksburg, center of NE¼SE¼ sec. 10, T. 15 N., R. 4 E., Warren County, Miss. *Survey No.* S59–Miss–75–1–(1 to 8). *Laboratory Nos.* 9921 to 9928.	Ap	0 to 7	5.9	1.31	0.120	10.9
	A3	7 to 10	5.2	.34	.051	7.0
	B1	10 to 16	5.1	.22	.045	5.0
	B2	16 to 32	5.1	.17	.041	4.0
	B3m1	32 to 42	5.3	.10		
	B3m2	42 to 52	5.5	.09		
	C1	52 to 72	5.6	.08		
	C12	72 to 84	5.4	.11		
Memphis silt loam:						
Location.—19 miles northeast of Vicksburg, NW¼SW¼ sec. 17, T. 17 N., R. 5 W., Warren County, Miss. *Survey No.* S59–Miss–75–2–(1 to 9). *Laboratory Nos.* 8970 to 8978.	A1	0 to 3	5.7	3.76	.200	18.0
	A2	3 to 9	4.9	.46	.043	11.0
	B21	9 to 13	4.9	.26	.040	6.0
	B22	13 to 23	5.0	.18	.034	5.0
	B23	23 to 31	5.1	.12	.028	4.0
	B31	31 to 41	5.2	.10		
	B32	41 to 51	5.4	.09		
	C11	51 to 67	5.6	.08		
	C12	67 to 77	5.6	.08		

properties of selected soils

Lincoln, Nebr. Lack of data indicates determination was not made.

Very fine sand (0.10-0.05 mm.)	Silt (0.05-0.002 mm.)	Clay (less than 0.002 mm.)	International classification: 0.2-0.02 mm.	International classification: 0.02-0.002 mm.	Textural class	Bulk density	Moisture held at tension of: 1/10 atmosphere	1/3 atmosphere	15 atmospheres
Pct.	Pct.	Pct.	Pct.	Pct.		Gm./cc.	Pct.	Pct.	Pct.
[illegible]	87.9	0.4	60	28.6	Silt	[illegible]43	41.5	28.[illegible]	5.4
[illegible]	79.9	18.8	48	32.8	Silt loam		36.5	24.4	[illegible]
[illegible]	79.3	20.2	42.6	37.2	Silt loam	[illegible]50	37.4	26.[illegible]	[illegible]
[illegible]	74.9	24.5	40.0	34.9	Silt loam	1.5[illegible]	39.6	29.9	10.4
[illegible]	75.2	23.8	42.[illegible]	34.1	Silt loam	1.62	40.4	28.5	10.3
[illegible]	70.4	22.6	43.[illegible]	33.7	Silt loam		42.6	30	9.8
[illegible]	[illegible]	2[illegible].2	43.9	34.9	Silt loam		[illegible]	30.0	9.6
[illegible]	61.3	8.0	44.4	37.6	Silt loam	1.[illegible]	39.8	28.7	9.3
[illegible]	88.5	4.7	54.5	35.9	Silt		[illegible]	29.	6.7
[illegible]	8[illegible]	9.0	55.8	35.2	Silt		36.4	24	3.[illegible]
[illegible]	[illegible]2	29.2	42.2	26.6	Silty clay loam		40.9	30.3	11.3
[illegible]	70.0	20.4	[illegible]	25.6	Silty clay loam		42.6	33	12.2
[illegible]	7[illegible].6	23.6	46.2	36.3	Silt loam		42.5	31.4	10.2
[illegible]	[illegible]8.0	20.8	48.4	36.8	Silt loam		4[illegible].8	30.6	[illegible].3
[illegible]	80.6	[illegible].4	5[illegible].7	30.8	Silt loam		4[illegible].2	29.8	8.0
[illegible]	85.2	[illegible]	52.0	3[illegible]	Silt loam		4[illegible].4	29.5	7.7
[illegible]	84.8	[illegible].8	64.2	32.0	Silt loam		4[illegible].6	30.4	[illegible].2

[1] Many light-brown and dark-brown concretions, possibly iron; few black concretions, possibly manganese.
Common irregular black concretions, possibly manganese.
[3] Few spherical and irregular light-brown to black concretions, possibly ferromanganese.

properties of selected soils

Lincoln, Nebr. Lack of data indicates determination was not made.

Free iron	Cation exchange capacity by NH_4Ac	Extractable cations (Milliequivalents per 100 grams of soil): Ca	Mg	H	Na	K	Sum of extractable cations	Ca/Mg ratio	Sum of extractable bases	Base saturation: By NH_4OAc	On sum of cations
Pct.	Meq./100 gm.						Meq./100 gm.		Meq./100 gm.	Pct.	Pct.
[illegible]	9[illegible]	4.[illegible]	[illegible].0	5.2	0	[illegible]	[illegible]	2.4	[illegible]	[illegible]	59
1.5	[illegible]	4.4	.9	7.3	[illegible]	[illegible]	[illegible]	[illegible].3	6.5	6[illegible]	47
1.4	9.3	[illegible]	2.2	8		[illegible]		[illegible]	[illegible].6	60	40
[illegible]	2.[illegible]	[illegible]	[illegible].0	9.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible].6	61	44
1.9	2[illegible]	[illegible]	3.6	9.0	[illegible]		[illegible].8	[illegible].6	[illegible]	8[illegible]	5[illegible]
[illegible].5	12	6.6	4.[illegible]	[illegible].3	[illegible]	3	8.5	1.6	1[illegible].2	[illegible]	6[illegible]
1.0	[illegible]3.0	6.7	3.6	7.3	2	3	16.3	1.8	1[illegible].0	86	60
[illegible]	[illegible]8	6.	[illegible].9	6.5	2		[illegible]6	[illegible]	9.6	8	60
[illegible]6	13.0	8.4	2.2	7.8	<.1	4	18.8	3.8	1[illegible].0	79	68
[illegible]7	8.1	[illegible]9	.4	5.4	.1	2	7.1	2.2	[illegible].7	33	24
1.7	15.1	6.7	3.3	8.8	.1	5	19.4	2.0	10.6	70	55
2.0	16.8	8.2	3.6	8.9	.1	6	21.3	2.3	12.4	[illegible]	58
[illegible].9	[illegible]4.5	7.4	3.[illegible]	[illegible]0		4	[illegible]	2.3	11.1	[illegible]6	61
[illegible]	[illegible].4		3.4	6.0		3	[illegible]0	2	[illegible]0	82	65
1.6	13.0	7.5	3.4	5.5	2	3	16.9	2.2	1[illegible].4	85	67
1.7	12.0	6.8	3.1	4.8	2	3	15.0	2.2	10.4	87	69
[illegible]6	1[illegible].6	6.6	3.[illegible]		3	[illegible]	[illegible]	[illegible]	9.3	59	72

[illegible] Memphis [illegible] magnesium, except for the loss through leaching [illegible] the profile.

[illegible]

[illegible] Memphis soil.

[illegible] Ap horizon, 40 to 47 percent in the A3 [illegible] for the Ap horizon.

DESCRIPTIONS OF PROFILES FROM WHICH SAMPLES WERE TAKEN

Loring silt loam.—Profile located in pecan grove about 20 years old, on State Highway 27 about 8 miles southeast of Vicksburg in the center of NE¼SE¼ sec. 10, T. 15 N., R. 4 E., Warren County, Miss., ground cover is native grass and weeds.

[illegible]

few fine and medium manganese concretions and coatings; clear, smooth boundary.

B2—18 to 32 inches, dark-brown (7.5YR 4/4) silty clay loam; moderate, fine and medium, subangular blocky structure; [illegible]

[illegible] cracks; large manganese coatings and concretions; few fine pores; gradual, wavy boundary.

C1—52 to 72 inches, dark-brown (7.5YR 4/4) silt loam; [illegible]

[illegible] dark-brown (7.5YR 4/4) silt loam; [illegible] friable; few, light-gray (5Y 7/1), thin silt coatings on ped faces and in cracks; few fine manganese coatings.

The colors in the foregoing description are for moist soil.

The Loring soils are the well drained or moderately well drained members of the catena that includes the somewhat excessively drained Natchez soils, the well drained Memphis soils, the moderately well drained Grenada soils, the somewhat poorly drained Calloway soils, and the poorly drained Henry soils.

Slope and relief: Gentle slope (4 percent) toward [illegible] area.
Drainage class: Well drained.
Permeability: Moderate.
Parent material: Loess.

Memphis silt loam.—Profile located in hardwood forest, 10 miles northeast of Vicksburg in NW¼SW¼ sec. 17, T. 17 N., R. 5 W., Warren County, Miss., understory of locust, dogwood, wild cherry, holly, switchcane, ivy, and laurel.

A00—1 inch to 0, leaf litter from oak and some gum, elm, dogwood, and locust.

A1—0 to 3 inches, dark-gray to dark grayish-brown (10YR [illegible]

B22—13 to 23 inches, dark-brown (7.5YR 4/4) silt loam; moderate [illegible] subangular blocky structure; [illegible]

B23—[illegible]

B21—31 to 41 inches, dark-brown (7.5YR 4/2 to 4/4) silt loam; weak, medium and coarse, subangular blocky structure; friable; slightly plastic and slightly sticky when wet; manganese coatings on ped faces; numerous fine roots; clear, smooth boundary.

B22—[illegible] appears massive in place but has many fine cracks; breaks along cracks tend to produce some weak, medium to fine, subangular peds; friable; [illegible] boundary.

C11—41 to 67 inches, dark-brown (7.5YR 4/4) silt loam, [illegible] boundary.

C12—67 to 77 inches, dark-brown (10YR 4/3) silt loam; [illegible]

Colors in the foregoing description are for moist soil unless otherwise specified.

The Memphis soils are the well-drained members of the catena that includes the moderately well drained Grenada soils, the somewhat poorly drained Calloway soils, and the poorly drained Henry soils.

Slope and relief: Ridgetop with slopes of 2 to 5 percent; broken side slopes.
Drainage class: Well drained.
Permeability: Moderate.
Parent material: Loess.

General Nature of the County

One hundred years of colonial history, influenced by the French, British, and Spanish settlers, preceded the organization of Warren County.[4] Water transportation and help from friendly Indians made possible the first settlement in 1718 by the French at Haynes Bluff, near Redwood. In 1719 the first farming began. Thirty [illegible] were 14 farms on the Yazoo River and 2 in the hill area [illegible]

Tobacco and indigo were the staple crops grown by the [illegible] digo half a century later when English occupation began. Cotton soon became, and still is, the major crop. The one [illegible] resulted in erosion and depletion of the soil, and many farms or parts of farms were abandoned.

The county, as organized on December 22, 1809, included all of the Mississippi Territory north of the Big Black River, Sharkey, Issaquena, and Old Washington Counties, and part of Yazoo County. It was named for Dr. Joseph S. Warren, who was killed at Bunker Hill in the American Revolutionary War. Warrenton was designated as the county seat. That part of Warren County west of the Choctaw boundary was originally part of Adams County. Later it became Pickering County, and in 1808 it was a part of Claiborne County.

The first public levee built in the Mississippi Valley was constructed near Warrenton.

[illegible]

The city of Vicksburg, at the junction of the Yazoo and Mississippi Rivers, was planned by Newt Vick in 1819. It was incorporated in 1825.

Rural population shifts have occurred in Warren County because of mechanization of farms and because of decreased production in the hill areas, which has resulted from erosion. The erosion has lowered family income on small farms. Livestock production has increased on the larger farms.

Geology, Physiography, and Drainage

Warren County is marked by two distinct physiographic [illegible]

The Mississippi River alluvial plain is a broad, nearly [illegible] mer stream channels, and slack water areas. The layers [illegible] They contain a variety of minerals, for the drainage area [illegible] luvium washed from the loess hills also occurs as narrow belts along the adjacent uplands.

The alluvial plain is divided at Vicksburg, where the loess hills and the Mississippi River meet. South of Vicksburg, the maximum width of the plain is 4 miles. North of Vicksburg, it is approximately 20 miles. An [illegible] area, extends southward into the middle of this area.

Northwest of Vicksburg, the elevation is about 120 feet. Variations in elevation are slight. The lowest points are former stream channels and slack-water areas that are only a few feet higher than the normal height of the [illegible] The alluvial plain drains to the Mississippi River. The [illegible] quently, most areas need artificial drainage. Some [illegible]

The western edge of the loess hills consists of a line of steep hills and bluffs rising abruptly from the Mississippi alluvial plain and ranging from 75 to 125 feet in height. The general height of the bluffs does not change from Vicksburg northward. The elevation decreases and the slope is more gentle southward from Vicksburg. Eastward, the uplands slope gradually to the Big Black River [illegible]

The drainage system in the uplands is complete [illegible] River. The ridgetops, for the most part, are narrow and rounded, but some broaden into gently sloping areas.

A narrow divide with numerous short ridges branching [illegible] uplands. West of this ridge, drainage is into the Missis[illegible] westerly direction. North of Vicksburg, where the terrain is rough and hilly, many of the small creeks flow in a northwesterly direction. Here, the local relief in many [illegible] series of short drains occur along the western edge where the loess hill area joins the alluvial plain.

East of the ridge, all creeks flow directly into the Big Black River. Bear Creek and its tributaries drain much of the extreme north-central part of the uplands. Clear

Creek drains an area of approximately 3[illegible] square miles in the east-central part. Markham and Hamer Creeks drain the southeastern area.

Climate[5]

The climate of Warren County is generally hot and [illegible] in summer and mild to cold and humid in winter. Temperatures of 90° F. or higher occur on an average of 96 days in summer, and summer days are oppressive because of high humidity. July and August are the hottest months. Cold, wintry weather generally begins late in November and lasts through February. Winter is characterized by wide ranges in temperature; extremes of 85° above zero and 12° below zero have been recorded, but the average [illegible] low temperature remains well above freezing. Winds are generally light, but in winter strong winds may blow for a day or two with each outbreak of cold air from Canada and Alaska. Drainage of cold air from the hills into the valleys results in sharp differences in night temperatures. On calm, clear nights in winter, temperatures may be 10 to 15 degrees lower in the valleys than on the hilltops. When the wind blows, the hilltops are likely to be colder than the valleys.

Table 14 gives data on temperature and precipitation. The temperature data are based on records at Tallulah, La., but are considered representative of Warren County.

Probabilities of freezing temperatures on or after given dates in spring and on or before given dates in fall are given in table 15. Frost can form on vegetation on a calm, clear night if the temperature is 32° in an instrument shelter 5 feet above the ground. Because frost and low, though above freezing, temperatures adversely affect seeds and vegetation, the dates for threshold temperatures of 36° and 40° are included in table 15. The probabilities are based on records covering the period from 1930 to 1959. Adjustments have been made, where necessary, to take account of years when the temperature was never as low as the threshold specified.

Rainfall is heavy in all seasons. It is least heavy in September, October, and November. The yearly total is about 50 inches. Summer rains generally occur as afternoon thundershowers. Winter rains accompany cold fronts or result from the development of low-pressure systems over the Gulf of Mexico. Snow and sleet are rare. Tornadoes and hailstorms occur on an average of once in 20 years.

The climate [illegible] is suitable for many kinds of crops. The influence of climate on agriculture can be summarized as follows.

The soils, especially those on the flood plains of the Mississippi River and small streams, generally are too wet to be tilled in winter and in the early part of spring. There are generally some periods each winter when the soils of the loess hills are dry enough to be tilled.

The row crops commonly grown in the county are [illegible] and become established in April and May. During this period, the temperature and the moisture supply normally are favorable for the germination of seeds, and the soils are dry enough to permit extensive work in the fields. In fall, the moisture supply is generally favorable for the preparation of a seedbed and for the germination of seeds, but [illegible] germination may be retarded and preparation of seedbeds in the clayey soils [illegible].

The frost-free season (see table 15) is long enough that cotton, corn, soybeans, and other crops can be planted over a period of several weeks and still have plenty of time to

[5] [illegible] from records of the U.S. Weather Bureau, New Orleans, La.

TABLE 14.—*Temperature and precipitation, Warren County, Miss.*

[Temperature data for Tallulah, La., from 1931 to 1960. Precipitation data for Vicksburg, Miss., from [illegible] to [illegible]]

Month	Temperature: Average daily maximum	Temperature: Average daily minimum	Two years in 10 will have at least 4 days with— Maximum temperature equal to or higher than—	Two years in 10 will have at least 4 days with— Minimum temperature equal to or lower than—	Precipitation: Average total	One year in 10 will have— Less than—	One year in 10 will have— More than—	Days with snow cover of 1 inch or more	Average depth of snow on days with snow cover
	°F.	°F.	°F.	°F.	Inches	Inches	Inches		
January	[illegible]	37.6	[illegible]	20	5.80	2.38	9.15		
February	62.6	40.3	[illegible]	25	5.[illegible]	2.63	9.86	[illegible]	4
March	[illegible]	[illegible]	82	29	[illegible]	[illegible]	9.06	[illegible]	0
April	[illegible]	[illegible]	86	38	4.80	2.41	[illegible]	0	
May	88	66.5	[illegible]	49	4.33	[illegible]	[illegible]		[illegible]
June	90	67.3	96	57	3.36	[illegible]	[illegible]		0
July	[illegible]	[illegible]	97	65	3.80	[illegible]	[illegible]	[illegible]	
August	92.7	68	100	60	[illegible]	[illegible]	5.63		
September	87.6	62.0	96	48	[illegible]	[illegible]	4.30		
October	78	56.4	[illegible]	34	[illegible]	[illegible]	4.94	0	0
November	[illegible]	[illegible]	[illegible]	23	[illegible]	[illegible]	[illegible]	0	0
December	60.6	38.[illegible]	[illegible]		4.97	2.49	8.70		3
Year	[illegible]	52.9	[illegible]	[illegible]	[illegible]	[illegible]	66.27	[illegible]	[illegible]

[1] Less than 0.5 day. [2] Average annual highest maximum. [3] Average annual lowest minimum.

TABLE [illegible].—*Probabilities of [illegible] freezing temperatures in spring and first in fall, Warren County, Miss.*

All data from Tallulah, La.[1]

Probability	[illegible]	[illegible]	[illegible]	[illegible]	32° F.	[illegible]
Spring:						
1 year in 10 later than	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2 years in 10 later than	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5 years in 10 later than	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Fall:						
1 year in 10 earlier than	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2 years in 10 earlier than	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5 years in 10 earlier than	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible] data at Tallulah, La., for the same period justifies use of Tallulah data for Warren County, Miss.

mature. Winters are mild enough that fall-sown small [illegible] provides grazing for livestock during the winter, although [illegible] February. Fescue, clover, and other cool-season pasture plants make some growth during the winter when the [illegible] the temperature is 45° or lower are not long enough to [illegible] for most deciduous fruit trees. Nevertheless, a few varieties of stone and pome fruits do fairly well.

Community Facilities and Transportation

Churches of several denominations are located in Vicksburg and throughout the county. School buses provide transportation to county elementary and high schools at Culkin, Jett, and Redwood. Vicksburg, a separate school district, has three church schools, one of which is a junior college.

U.S. Highway No. 80 crosses the county from east to west; it enters west of Edwards, in Hinds County, and crosses the Mississippi River into Louisiana south of Vicksburg. U.S. Highway No. 61 passes through the county from north to south, and roughly parallels the Illinois Central Railroad throughout its course. Numerous State and county highways cross the county and provide easy access to all communities. The main county roads are surfaced, and the others are gravel.

Two main lines of the Illinois Central Railroad cross the county. The line from east to west connects Jackson, Miss., and Monroe, La. The other runs north and south and connects Chicago and New Orleans.

The Mississippi River provides transportation from its northern reaches to New Orleans. A new harbor in Vicksburg has joined railroad and water shipments. Barges transport timber and agricultural products on the lower Yazoo River between Vicksburg and Greenwood, which is in Leflore County.

In 1959 there were 511 telephones on farms. Four power companies serve Warren County. Electricity is available to all county residents.

Recreational facilities consist of playgrounds and tennis courts and rivers and lakes for boating, skiing, fishing, hunting, and swimming.

Natural Resources

Timber, soil, and water are the principal natural resources [illegible] Warren County. There [illegible] limestone, which is used in the production of cement, beneath the thick loessal caps.

[illegible] steep slopes of the loessal [illegible] of river plain. Large areas have been cut over. In some areas the trees are chiefly of undesirable species, but other [illegible] support fairly good stands of timber.

The Mississippi River forms the western boundary of the county. Other principal streams are the Yazoo River in the northern part of the county and the Big Black River, which forms the eastern boundary.

Much of the water for household use is pumped from shallow wells. There are several artesian wells in the county, some of which are at least 1,000 feet deep. Small to medium-sized farm ponds, which furnish water for the livestock and for recreation, are fairly common in the loess hills. Most of these ponds have been stocked with game fish.

A fairly large fishing resort is located on Eagle Lake, a former channel of the Mississippi River. The lake is well [illegible]. Lakes, bayous, and rivers throughout the county are fairly well stocked.

Fur-bearing animals, principally raccoons, foxes, squirrels, and rabbits, are plentiful. There are also deer and a few wild turkeys. Doves are fairly plentiful. Quail and ducks are fairly common.

Industries

The major industries in Warren County are lumbering, the raising and marketing of livestock, the operation of feed mills, the manufacture of heavy machinery and mobile homes, the operation of cotton gins and compresses, the storage of cotton, and the production of fertilizer.

Agriculture

The total area of Warren County is 382,240 acres, and about 61 percent of this acreage is in farms. The 1959 census report shows that the number of farms decreased from 1,316 in 1954 to 769 in 1959, but that the average size increased from 186.6 acres in 1954 to 287.8 acres in 1959. In 1959 there were 463 farms of less than 100 acres, 256 farms of between 100 and 999 acres, and 50 farms of 1,000 acres or more. The largest farms are generally on the most productive soils, which were cleared by the first settlers. Some small farms are in the areas settled in recent years.

Crops and pasture

The acreage of pasture and of the principal crops in stated years is shown in table 16. Corn is grown on the largest acreage, and hay, cotton, and soybeans, in the order named, are grown on the next largest acreages.

Most farmers use their best soils for growing cotton. In recent years the yields of cotton per acre have increased because of the development of better varieties and improvement in methods of management.

Soybeans, used principally for oil, grow fairly well on most soils in the county. The higher yielding varieties recently developed have made soybeans a good cash crop.

Oats and small grain are also well suited to most soils. Yields of 50 bushels of oats or more per acre have been obtained.

Corn is well suited to the Commerce, Robinsonville, Memphis, Grenada, Adler, Collins, Morganfield, Falaya, and Waverly soils. It is poorly suited to [illegible] water soils and to poorly drained soils that are shallow over a fragipan.

Good yields of hay are obtained if the soils are properly managed. Some annual lespedeza is grown for hay. [illegible] also are suited for hay.

TABLE 16.—*Acreage of principal crops and pasture in stated years*

Crop	1954	1959
	Acres	*Acres*
Corn harvested for grain	[illegible]	[illegible]54
Hay, total cut	[illegible]	4,[illegible]
Cotton	8,[illegible]	4,43[illegible]
Soybeans for all purposes	[illegible]	[illegible]
Soybeans harvested for beans	[illegible]	[illegible]
Oats threshed or combined	420	[illegible]
Pasture:		
Cropland used only as pasture	20,008	34,595
Woodland pasture	125,129	90,549
Other pasture	26,[illegible]9	21,870

Livestock

The number of cattle and calves decreased from 30,704 in 1954 to 27,887 in 1959. There are a few dairies in the county. Most of the cattle are beef cattle; many of the herds are of good grade.

The number of hogs and pigs increased from 10,819 in 1954 to 11,014 in 1959. Most of the hogs are of good quality.

The number of sheep and lambs decreased from 1,236 in 1954 to 720 in 1959. Most of the sheep are of good quality.

The use of tractors on most farms in the county has resulted in a reduction in the number of mules.

The corn, small grain, and hay grown in the county provide enough feed for the livestock raised.

Tenure and farm equipment

In 1959 there were 769 farms in the county. Of the farm operators 203 were tenants, 439 were full owners, 122 were part owners, and 6 were managers. Tenants operate [illegible] percent of all farms. Sharecroppers operate some of the large farms under the supervision of managers. Under the plantation system, the owner or operator furnishes all equipment, advances credit for subsistence, and receives approximately 50 percent of the cotton crop. Some tenants furnish their own equipment and pay cash for rent; others give a share of their crop for rent.

According to the 1959 census, there were 603 automobiles on 5[illegible]5 farms, 494 motor trucks on 41[illegible] farms, 569 tractors on 33[illegible] farms, and 50 grain combines on 38 farms.

Use of commercial fertilizer

According to the 1959 census, farmers in Warren County reported using 816 tons of commercial fertilizer on hay and cropland pasture, 107 tons on other pasture, 899 tons on corn, 504 tons on cotton, 7 tons on soybeans, and 154 tons on fruits, vegetables, and other crops.

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Glossary

[illegible] erial, such as sand, silt, or clay, that has been [illegible] d by streams.

[illegible]

boonite and iron oxide are examples of material commonly found in concretions.

[illegible]tence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent; will not hold together in a ma[illegible]

Friable.—When moist, crushes easily under moder[illegible]

[illegible]

planting, and harvesting in [illegible] e natural direction of the slope or that are parallel to terrace grade.

Crowning. See Bedding.

[illegible]

[illegible]l. The manner in which a soil originated, with [illegible]

Graded rows. Rows arranged with a slight grade or drop in elevation so that water flows off slowly, without washing.

Granular. See Structure, soil.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming [illegible]

[illegible]

rock that presumably was the source of material in the C horizon, it is designated Dr.

Humus. The well-decomposed, more or less [illegible] of the organic matter in mineral soil.

Internal soil drainage. The downward movement of water through the soil profile. The rate of movement is determined by the texture, structure, and other characteristics of the soil profile and underlying layers, and by the height of the water table.

[illegible]

Leaching. [illegible] material by percolating wa[illegible]

Massive. See Structure, soil.

Morphology, soil. The makeup of the soil, including the texture, structure, consistence, color, and other physical, mineralogical, and biological properties of the various horizons of the soil profile.

Mottled. Irregularly marked with spots of different colors that [illegible] as follows: Abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are these: *fine,* less than 5 milli[illegible] about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

[illegible]

Excessively drained soils are commonly very porous and rapidly [illegible]

[illegible]-drained soils are nearly free from mottling and are commonly of intermediate texture.

[illegible] uniform color in the A and upper B horizons [illegible] mottling in the lower B and the C horizons.

Imperfectly or somewhat poorly drained soils are wet for significant periods but not all the time.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

[illegible]

Permeability. The quality that enables water or air to move [illegible]

[illegible]

A pH value of 7.0 indicates precise neutrality; a higher value, alkalinity; and a lower value, acidity. In words, the degrees [illegible]

Extremely acid	[illegible]
Very strongly ac[illegible]	[illegible]
[illegible]	[illegible]
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered [illegible]

Sand. Individual rock or mineral fragments in soils having diameters ranging from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that is 85 percent or more sand and not more than 10 percent clay.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Single grain. See Structure, soil.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting upon parent material, as conditioned by relief, over periods of time.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the profile below plow depth.

Substratum. Any layer lying beneath the solum, or true soil; the C or D horizon.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

GUIDE TO MAPPING UNITS, CAPABILITY UNITS, AND WOODLAND SUITABILITY GROUPS

[See table 1, p. 4, for approximate acreage and proportionate extent of soils; table 2, p. 24, for estimated average acre yields; table 6, p. 30, for tree-planting sites and suitable species; and table 8, p. 38, table 9, p. 42, and table 10, p. 48, for engineering properties of soils]

Map symbol	Mapping unit	Page	Capability unit: Symbol	Capability unit: Page	Woodland suitability group: Number	Woodland suitability group: Page
Ad	Adler silt loam	4	IIw-3	19	1	29
Am	Adler and Morganfield silt loams, local alluvium	5	IIw-3	19		29
A	Alligator clay	5	IIIw-3	21	2	29
Bo	Bowdre silty clay	5	IIIw-1	20	3	29
Ca	Calloway silt loam	6	IIw-5	20	4	29
Cl	Collins silt loam	6	IIw-3	19	5	32
Cm	Collins silt loam, local alluvium	6	IIw-3	19	5	32
Cn	Commerce silt loam	7	I-2	8	7	32
Co	Commerce silty clay loam	7	IIw	9	7	32
Cp	Commerce very fine sandy loam	7	I-2	8	7	32
Cr	Commerce, Robinsonville, and Crevasse soils	7	Vw-1	22	7	32
Cy	Crevasse fine sandy loam	8	IIIs	21	8	33
Do	Dowling clay	8	Vw-2	22	9	33
Fa	Falaya silt loam	9	IIw-4	9	6	32
F	Falaya silt loam, local alluvium	9	IIw-4	[illegible]	6	32
GrA	Grenada silt loam, 0 to 2 percent slopes	9	IIw-2		4	29
GrB	Grenada silt loam, 2 to 5 percent slopes	9	IIe-2	8	4	29
GrB2	Grenada silt loam, 2 to 5 percent slopes, eroded	9	IIe-2	18	4	29
GrC3	Grenada silt loam, 5 to 8 percent slopes, severely eroded	9	IVe-2	22	4	29
Gu	Gullied land	10	VIIe-2	23	0	33
He	Henry silt loam	10	IIIw-2	21	1	34
MeA	Memphis silt loam, 0 to 2 percent slopes	11	I-1		2	34
MeB	Memphis silt loam, 2 to 5 percent slopes	11	IIe-1	8	2	34
MeB2	Memphis silt loam, 2 to 5 percent slopes, eroded	11	IIe-1	8	2	34
MeB3	Memphis silt loam, 2 to 5 percent slopes, severely eroded	11	IIIe-1	20	2	34
MeC2	Memphis silt loam, 5 to 8 percent slopes, eroded	11	IIIe-1	20	2	34
MeC3	Memphis silt loam, 5 to 8 percent slopes, severely eroded	11	IIIe-1	20	2	34
MlA	Memphis and Loring silt loams, 0 to 2 percent slopes	12	I-1	7	2	34
MlB	Memphis and Loring silt loams, 2 to 5 percent slopes	12	IIe-1	8	2	34
MlB2	Memphis and Loring silt loams, 2 to 5 percent slopes, eroded	12	IIe-1	8	2	34
MlB3	Memphis and Loring silt loams, 2 to 5 percent slopes, severely eroded	12	IIIe-1	20	2	34
MlC2	Memphis and Loring silt loams, 5 to 8 percent slopes, eroded	12	IIIe-1	20	2	34
MlC3	Memphis and Loring silt loams, 5 to 8 percent slopes, severely eroded	12	IIIe	21	2	34
MnD3	Memphis and Natchez silt loams, 8 to 12 percent slopes, severely eroded	12	IVe-1	22	0	33
MnE3	Memphis and Natchez silt loams, 12 to 17 percent slopes, severely eroded	12	VIe-1	22	0	33
MnF2	Memphis and Natchez silt loams, 17 to 40 percent slopes, eroded	12	VIIe	23	0	33
Mo	Morganfield silt loam	13	IIw-3	19		29
Ro	Robinsonville loam	13	I-2	8		32
Sa	Sharkey clay	14	IIIw-3	21	2	29
Sd	Sharkey, Tunica, and Dowling clays	14	Vw-2	22	2	29
SsC	Silty land, rolling	14	VIIe-1	23		
SsF	Silty land, steep	14	VIIe	23		
Sw	Swamp	14	VIIw-1	23	9	33
Tu	Tunica silty clay	15	IIIw-1	21	3	29
Wa	Wakeland silt loam	15	IIw-4	19	1	29
Wd	Wakeland silt loam, local alluvium	15	IIw-4	19	1	29
Wf	Waverly and Falaya silt loams	15	Vw	22	0	33

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For additional information dealing with Supplemental Nutrition Assistance Program (SNAP) issues, call either the USDA SNAP Hotline Number at (800) 221-5689, which is also in Spanish, or the State Information/Hotline Numbers (http://directives.sc.egov.usda.gov/33085.wba).

All Other Inquiries

For information not pertaining to civil rights, please refer to the listing of the USDA Agencies and Offices (http://directives.sc.egov.usda.gov/33086.wba).

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
MISSISSIPPI AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

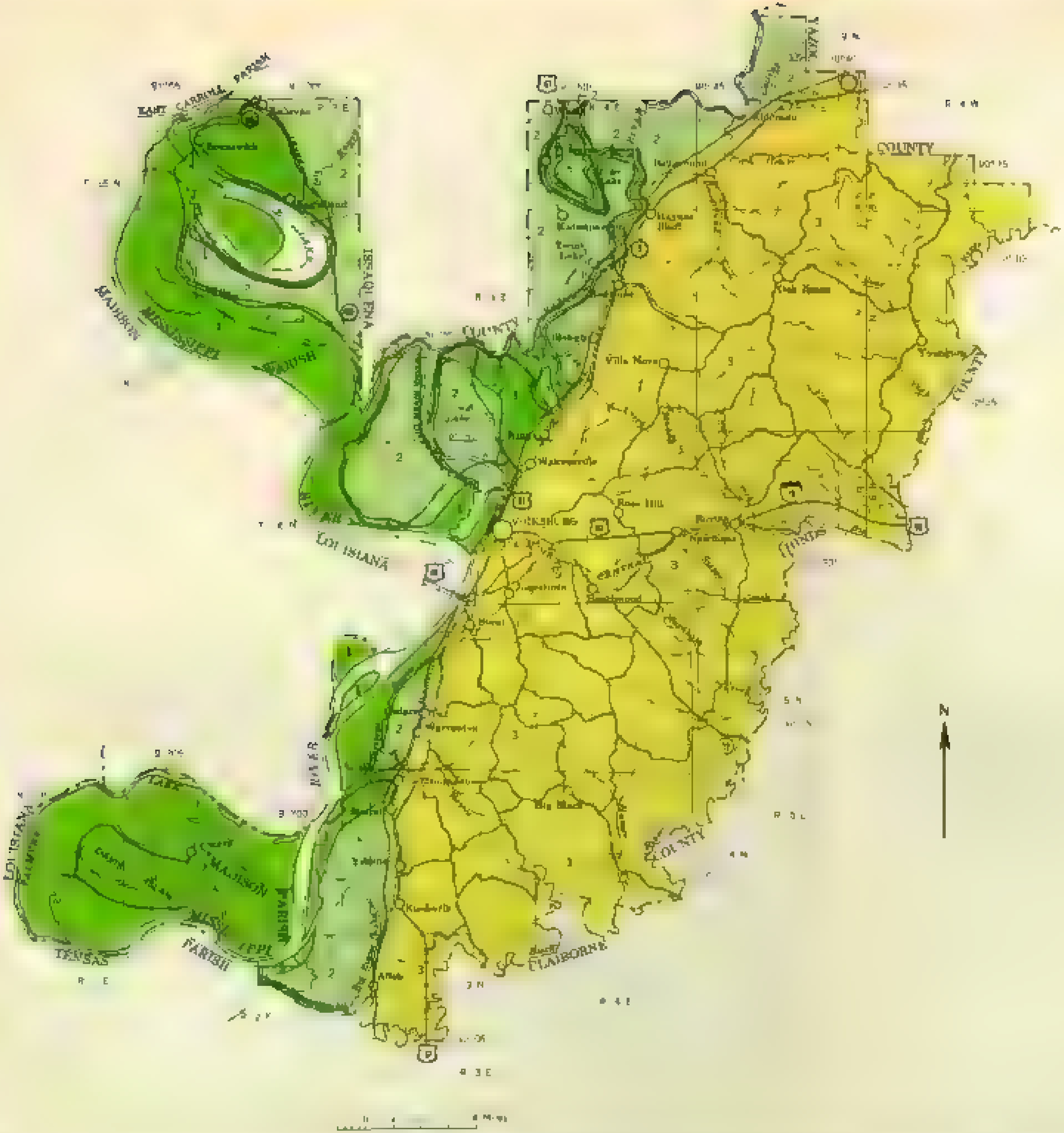
WARREN COUNTY, MISSISSIPPI

SOIL ASSOCIATIONS

1 Commerce-Robinsonville-Crevasse association: Somewhat poorly drained to excessively drained soils in medium-textured and coarse-textured recent alluvium

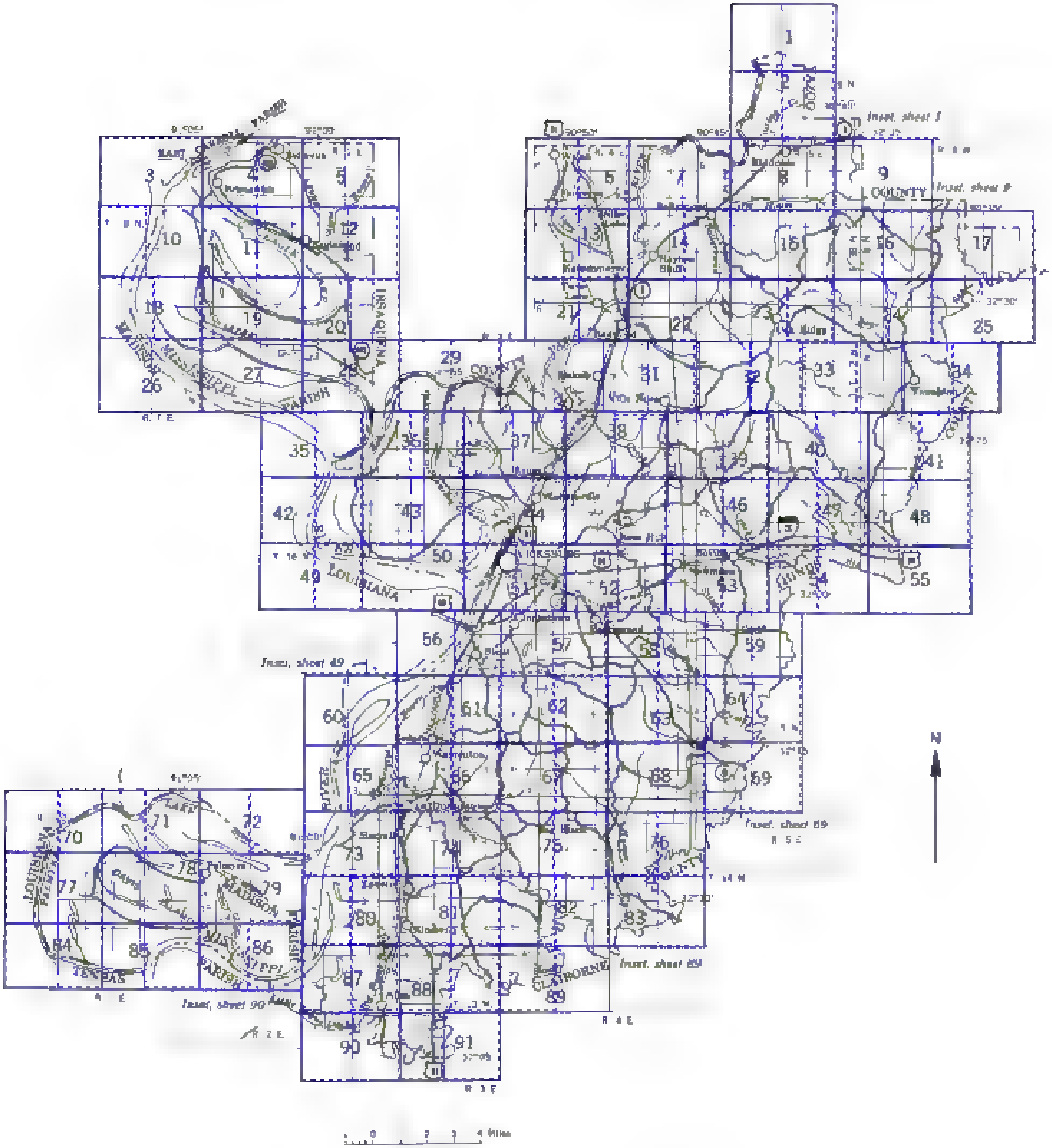
2 Sharkey-Tunica-Dowling association: Poorly drained and somewhat poorly drained soils in fine-textured slack-water alluvium

3 Memphis-Natchez-Adler association: Well drained and moderately well drained soils of hilly loessal uplands and local silty alluvium



INDEX TO MAP SHEETS

WARREN COUNTY, MISSISSIPPI



SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, E, or F, shows the slope. Symbols for nearly level soils, such as Adler silt loam, do not contain a slope letter. Neither does the symbol for a land type that has a considerable range in slope, such as Gullied land. The number 2 or 3 in a symbol indicates that the soil is eroded or severely eroded.

SYMBOL	NAME
Ad	Adler silt loam
[illegible]	Adler and Morganfield silt loams, local alluvium
[illegible]	Alligator clay
Bo	Bowdre silty clay
[illegible]	Calloway silt loam
[illegible]	Collins silt loam
[illegible]	Collins silt loam, local alluvium
[illegible]	Commerce silt loam
[illegible]	Commerce silty clay loam
[illegible]	Commerce very fine sandy loam
[illegible]	Commerce, Robinsonville, and Crevasse soils
[illegible]	Crevasse fine sandy loam
[illegible]	Dowling clay
[illegible]	Falaya silt loam
[illegible]	Falaya silt loam, local alluvium
[illegible]	Grenada silt loam, 0 to 2 percent slopes
[illegible]	Grenada silt loam, 2 to 5 percent slopes
[illegible]	Grenada silt loam, 2 to 5 percent slopes, eroded
[illegible]	Grenada silt loam, 5 to 8 percent slopes, severely eroded
[illegible]	Gullied land
[illegible]	Henry silt loam
[illegible]	Memphis silt loam, 0 to 2 percent slopes
[illegible]	Memphis silt loam, 2 to 5 percent slopes
[illegible]	Memphis silt loam, 2 to 5 percent slopes, eroded
[illegible]	Memphis silt loam, 2 to 5 percent slopes, severely eroded
[illegible]	Memphis silt loam, 5 to 8 percent slopes, eroded
[illegible]	Memphis silt loam, 5 to 8 percent slopes, severely eroded
[illegible]	Memphis and Loring silt loams, 0 to [illegible] percent slopes
[illegible]	Memphis and Loring silt loams, 2 to 5 percent slopes
[illegible]	Memphis and Loring silt loams, 2 to 5 percent slopes, eroded
[illegible]	Memphis and Loring silt loams, 2 to 5 percent slopes, severely eroded
[illegible]	Memphis and Loring silt loams, 5 to 8 percent slopes, eroded
[illegible]	Memphis and Loring silt loams, 5 to 8 percent slopes, severely eroded
[illegible]	Memphis and Natchez silt loams, 8 to [illegible]2 percent slopes, severely eroded
[illegible]	Memphis and Natchez silt loams, [illegible]2 to [illegible]7 percent slopes, severely eroded
[illegible]	Memphis and Natchez silt loams, [illegible]7 to 40 percent slopes, eroded
[illegible]	Morganfield silt loam
[illegible]	Robinsonville loam
[illegible]	Sharkey clay
[illegible]	Sharkey, [illegible], and Dowling clays
[illegible]	Silty land, rolling
[illegible]	Silty land, steep
[illegible]	Swamp
[illegible]	Tunica silty clay
[illegible]	Wakeland silt loam
[illegible]	Wakeland silt loam, local alluvium
[illegible]	Wakeland and Falaya silt loams

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads
- Dual
- Good motor
- Poor motor
- Trail

Highway markers
- National Interstate
- U. S.
- State

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail, foot
- Railroad
- Ferries
- Ford
- Grade
- R. R. over
- R. R. under
- Tunnel

Buildings
- School
- Church
- Summer or winter cottage
- Borrow pit

Mine dump

Pits, gravel or other

Power lines

Pipe lines

Cemeteries

Dams

Levees

Tanks

Cotton gin

Steam

BOUNDARIES

- National or state
- County
- Township, U. S.
- Section line, corner
- Reservation
- Land grant

DRAINAGE

Streams
- Perennial
- Intermittent, unclass.

Canals and ditches (CANAL, DITCH)

Lakes and ponds
- Perennial
- Intermittent

Wells (flowing)

Springs

Marsh

Wet spot

RELIEF

Escarpments
- Bedrock
- Other

Prominent peaks

Depressions (Large, Small)
- Crossable with tillage implements
- Not crossable with tillage implements
- Contains water most of the time

SOIL SURVEY DATA

- Soil boundary and symbol
- Gravel
- Stones
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land
- Severely eroded spot
- Blowout, wind erosion
- Gullies
- Indian mound

Soil map constructed 196[illegible] by Cartographic Division, Soil Conservation Service, USDA, from 1956 aerial photographs. Controlled mosaic based on Mississippi plane coordinate system, west zone, transverse Mercator projection, 1927 North American datum.

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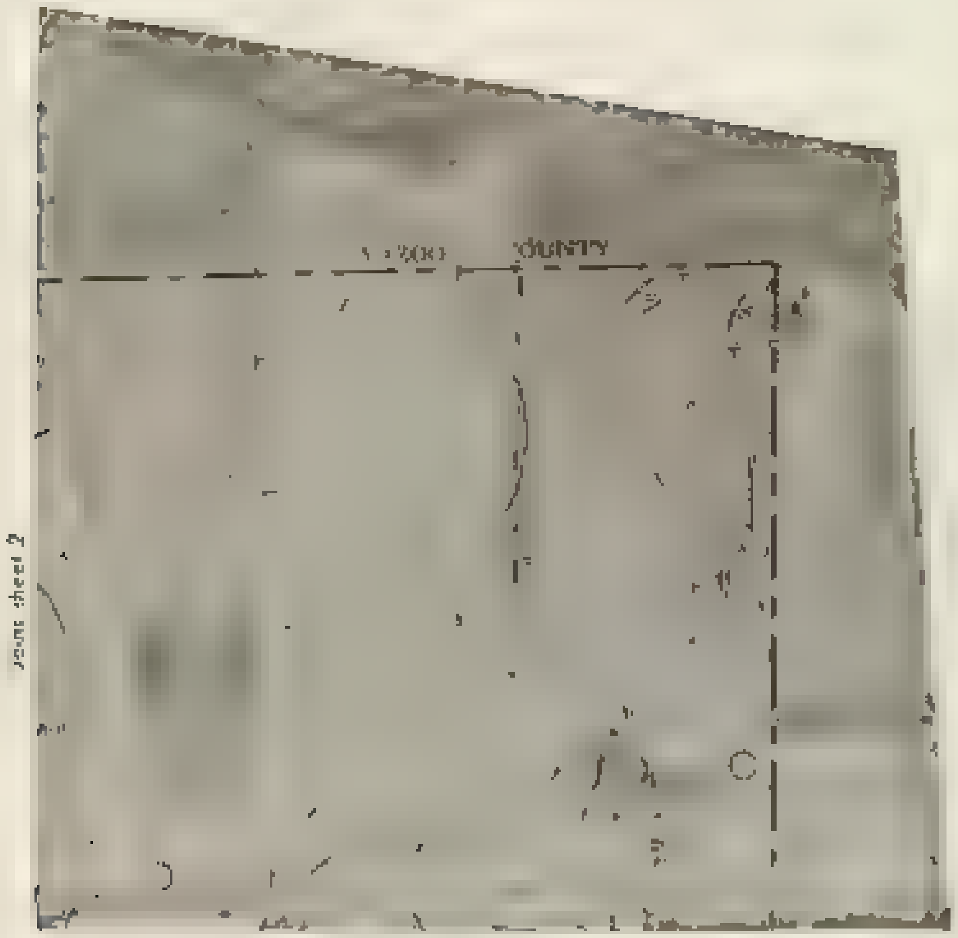

2

MISSISSIPPI — SHEET NUMBER 2

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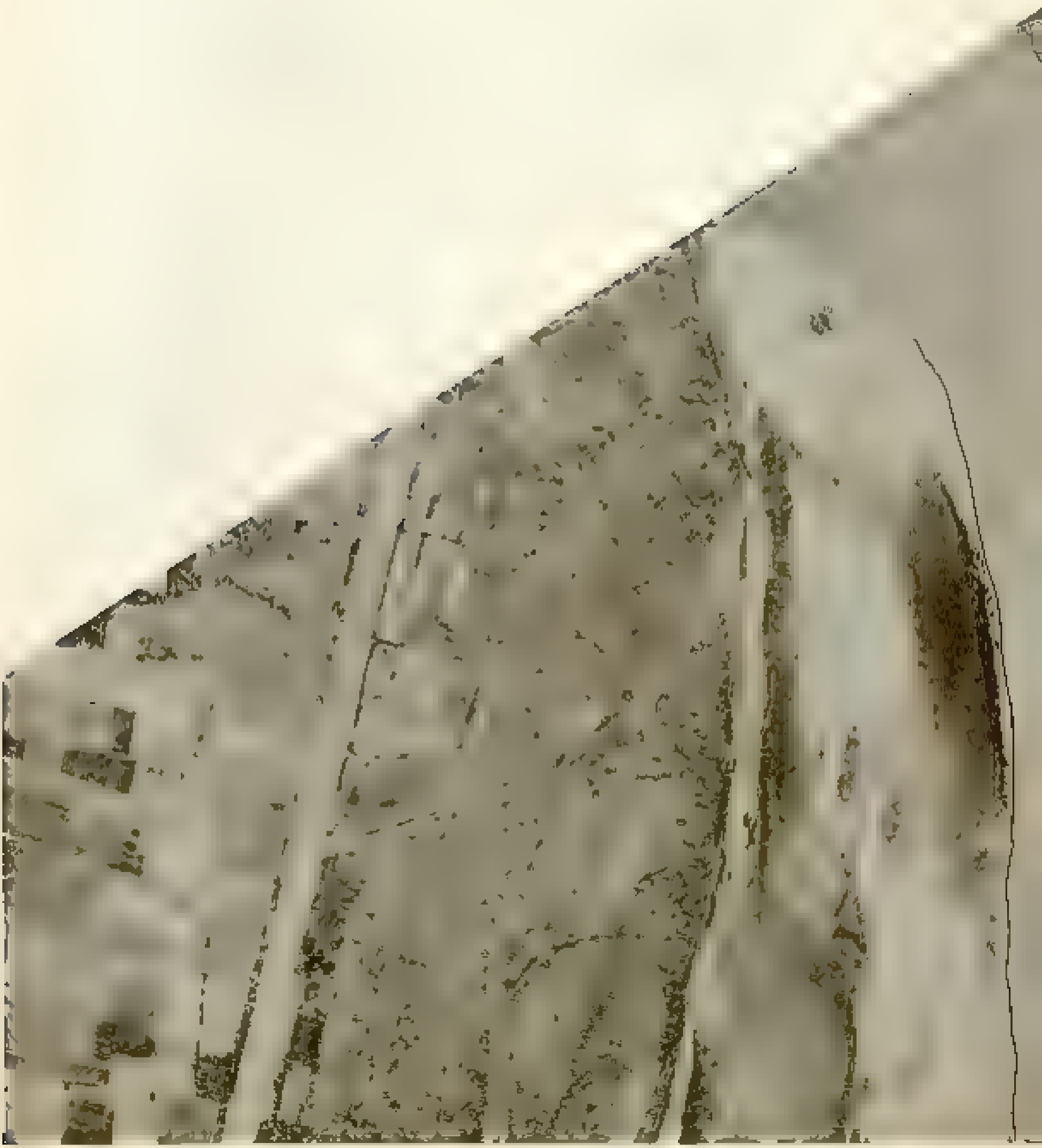

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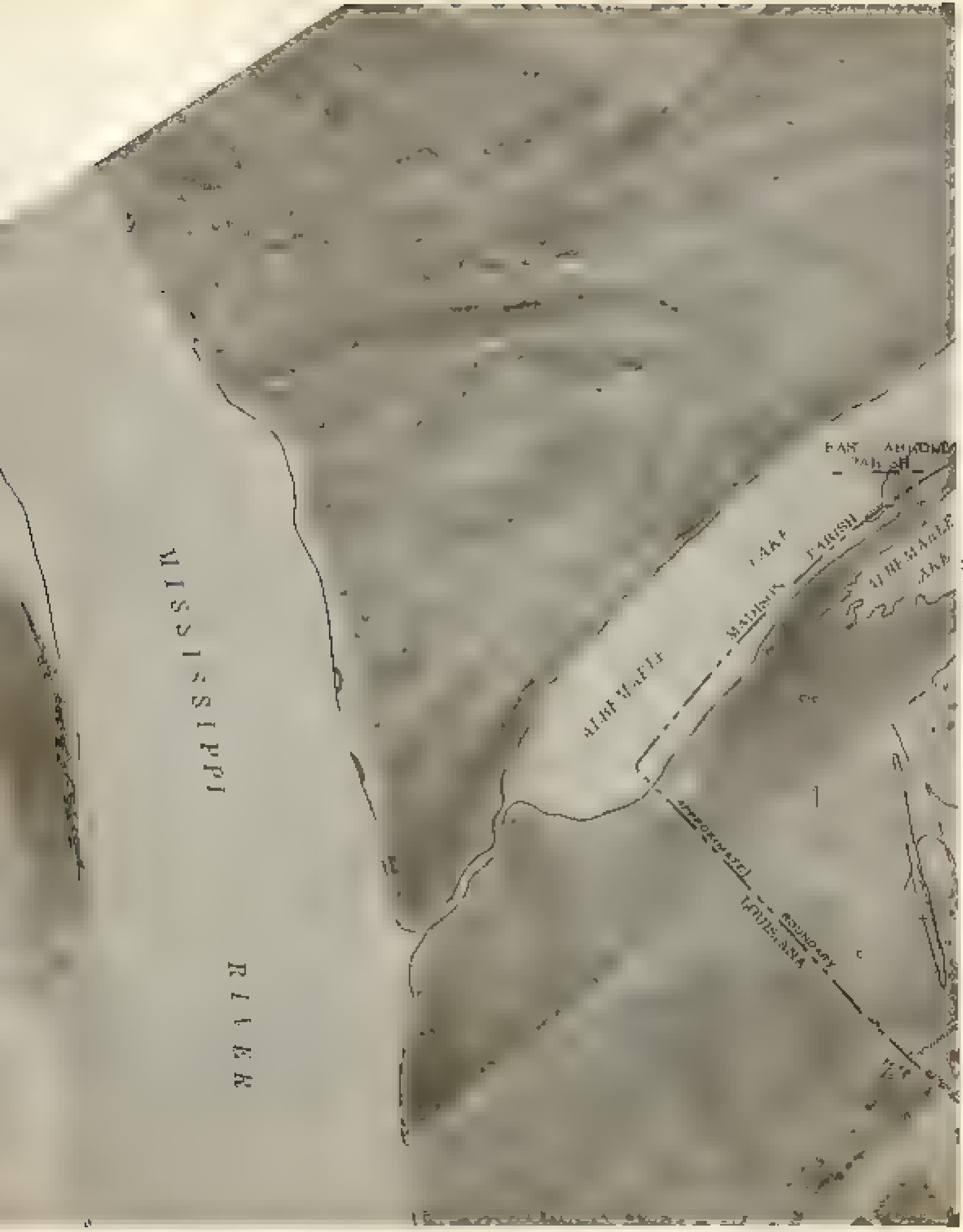

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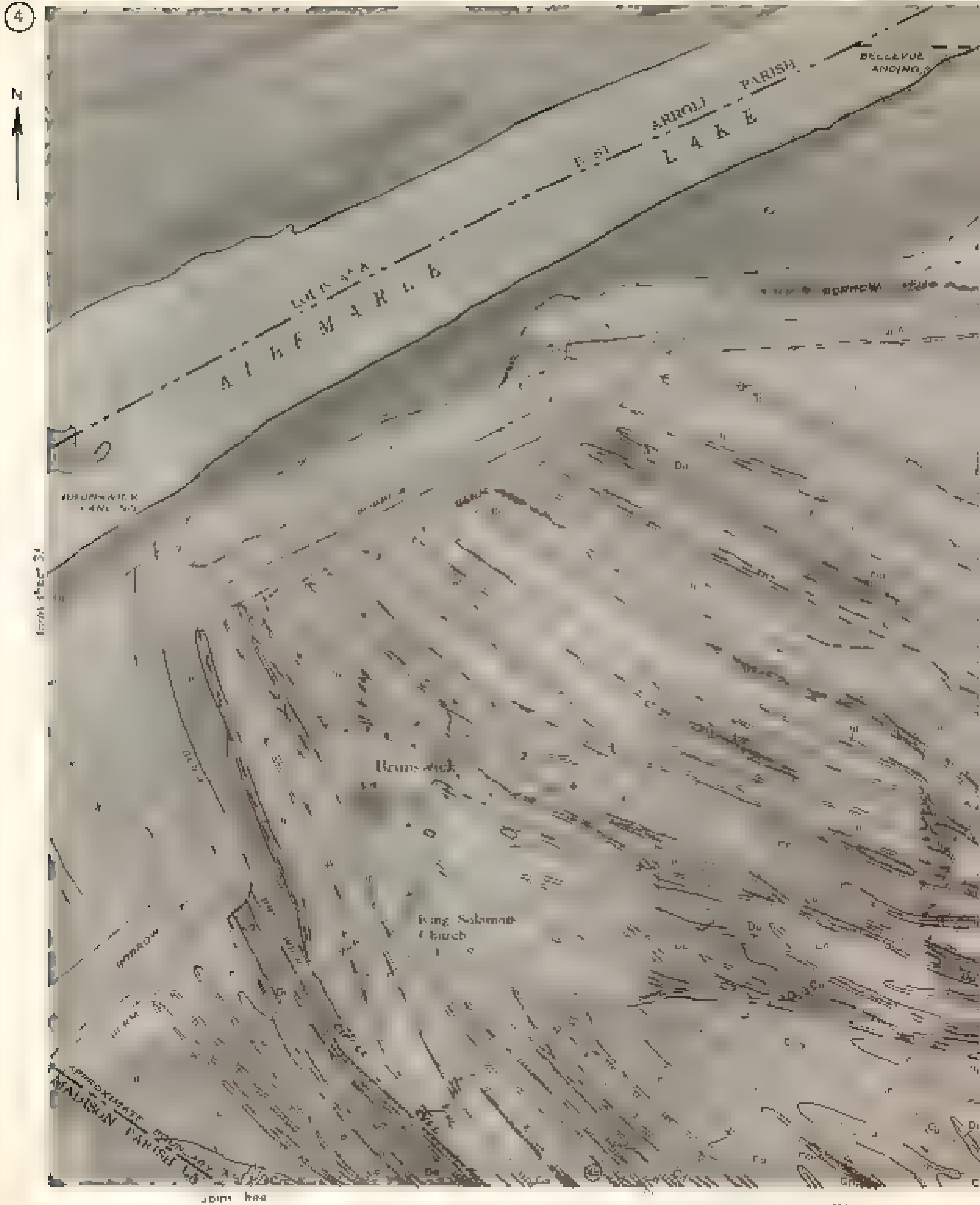

4
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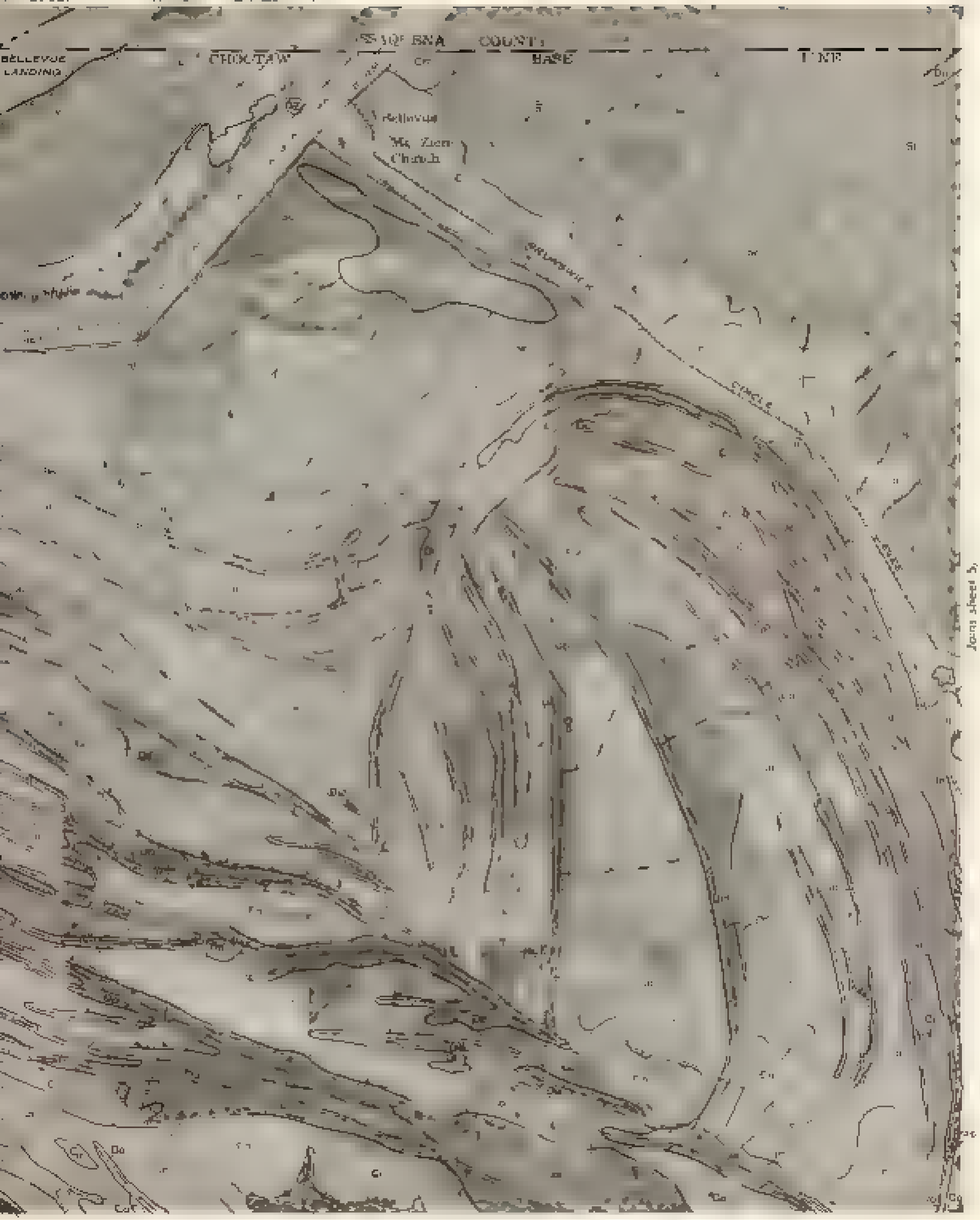
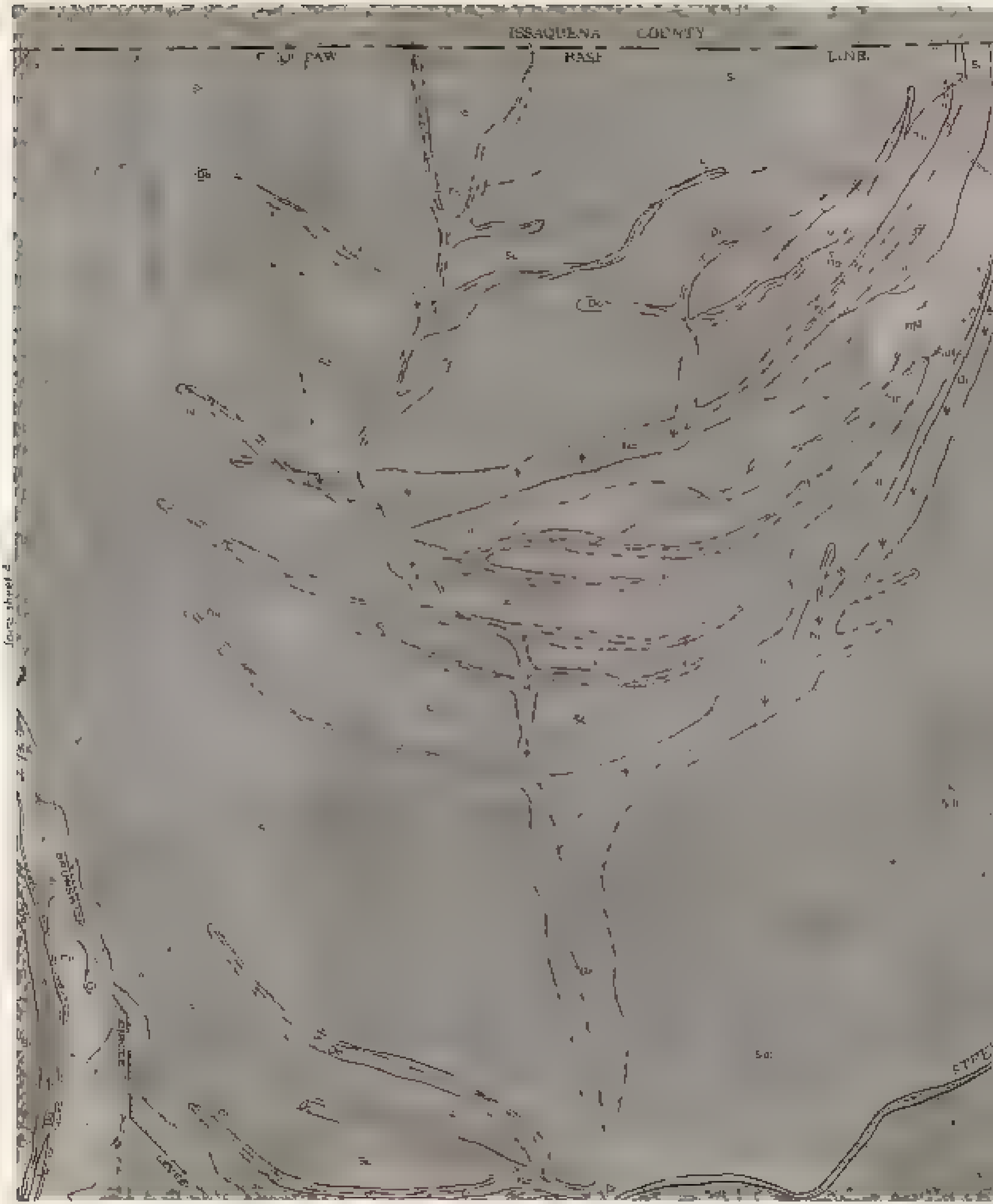
BELLEVUE LANDING
PARISH
LAKE
BORROW
Brunswick
King Solomon Church
BORROW
APPROXIMATE BOUNDARY
MADISON PARISH LA


BELLEVUE LANDING
CHOCTAW
COUNTY
BASE
LINE
Bellevue
Mt. Zion Church
CIRCLE
Joins sheet 5



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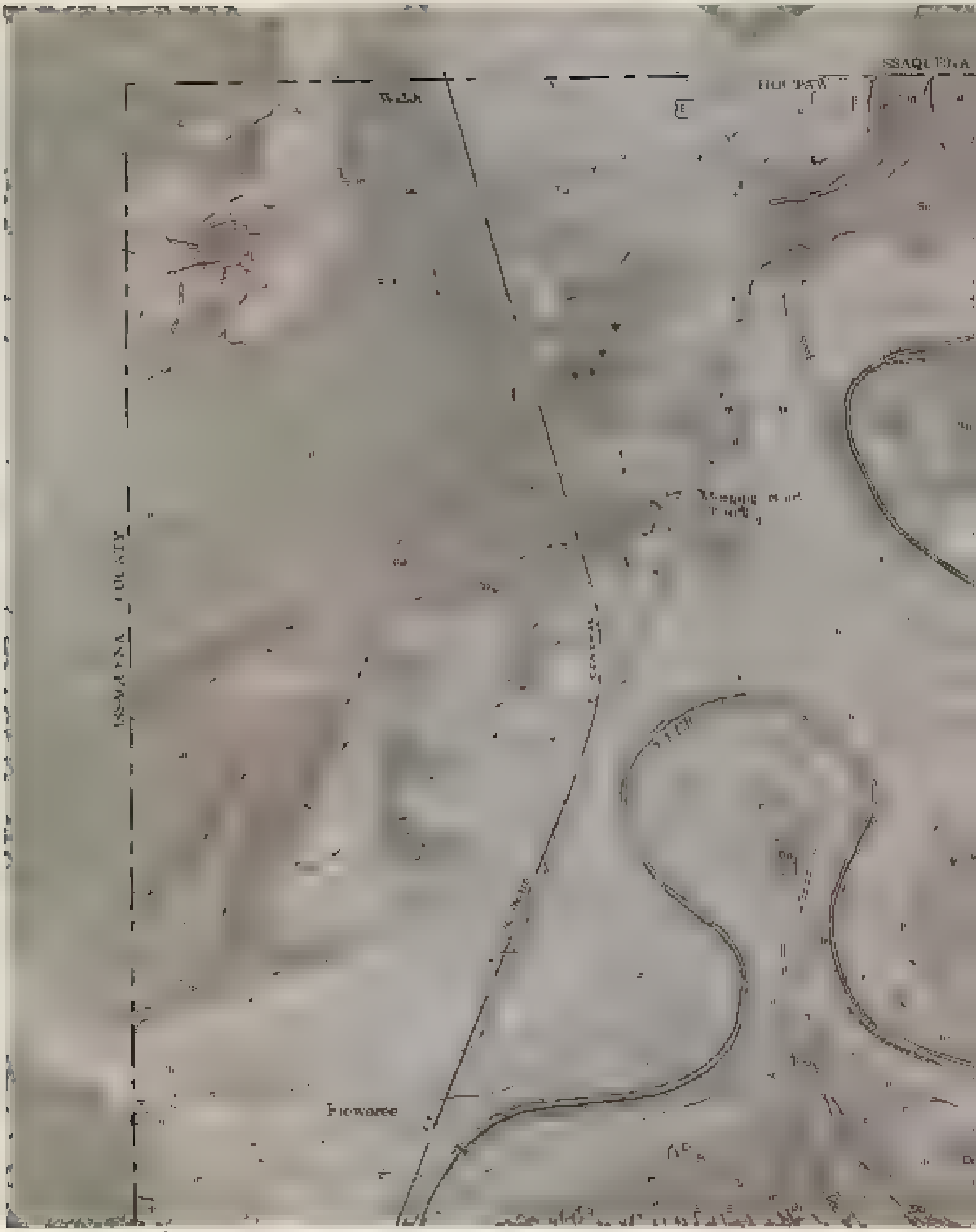

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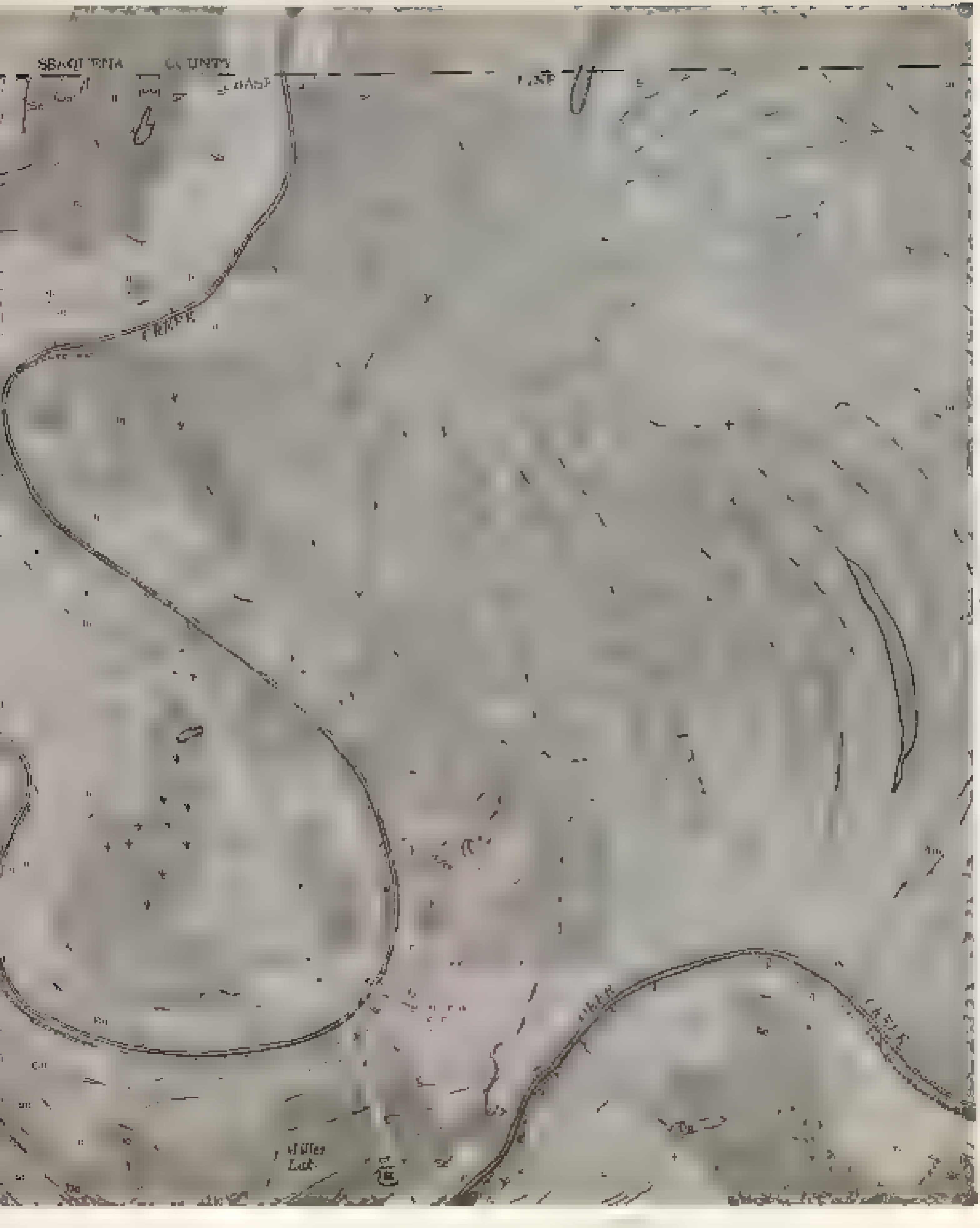
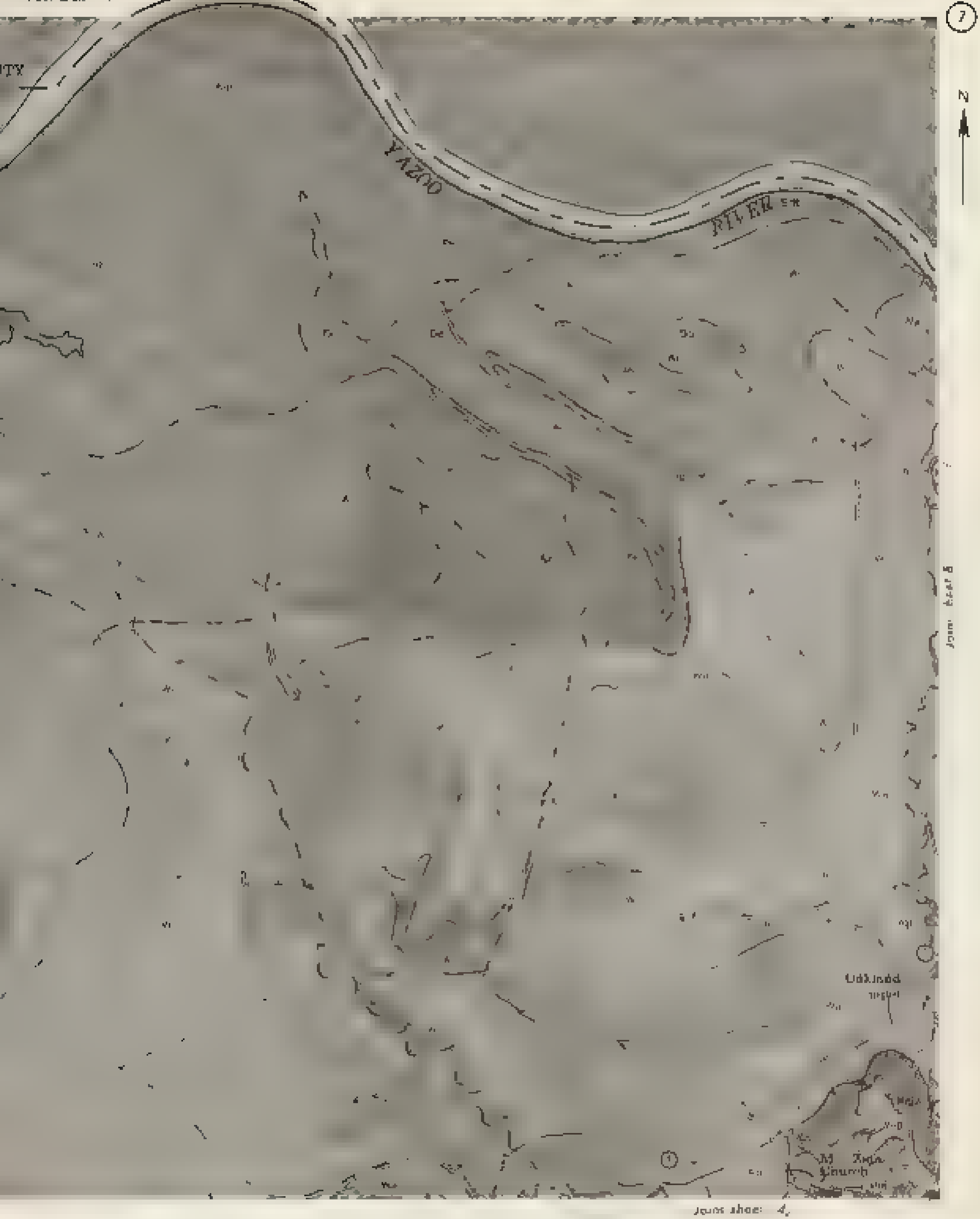

CREEK


CHOCTAW
BASE
LINE
ISSAQUENA
COUNTY
Horseshoe
Lake


7
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YAZOO
RIVER
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Joins sheet 5


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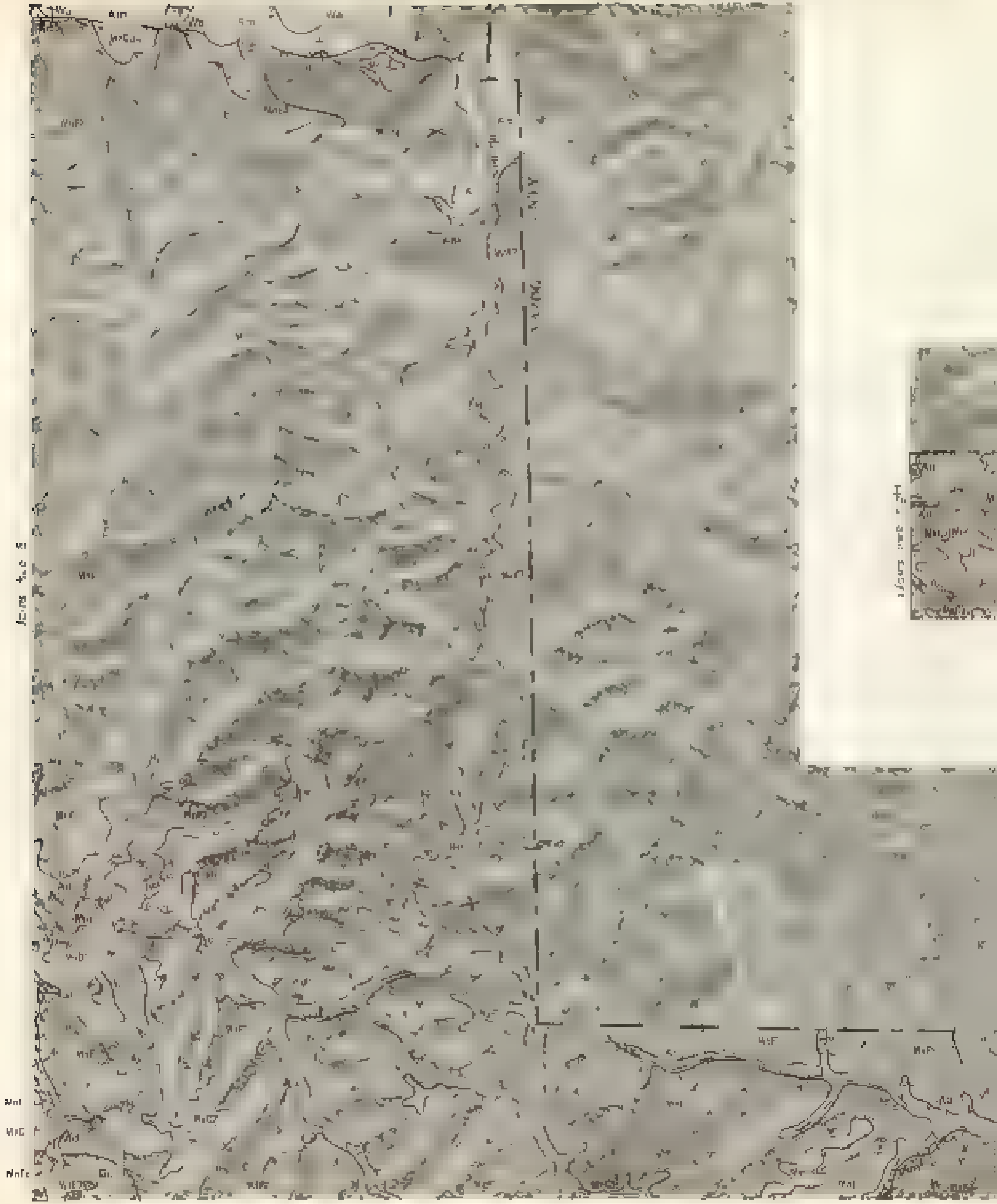

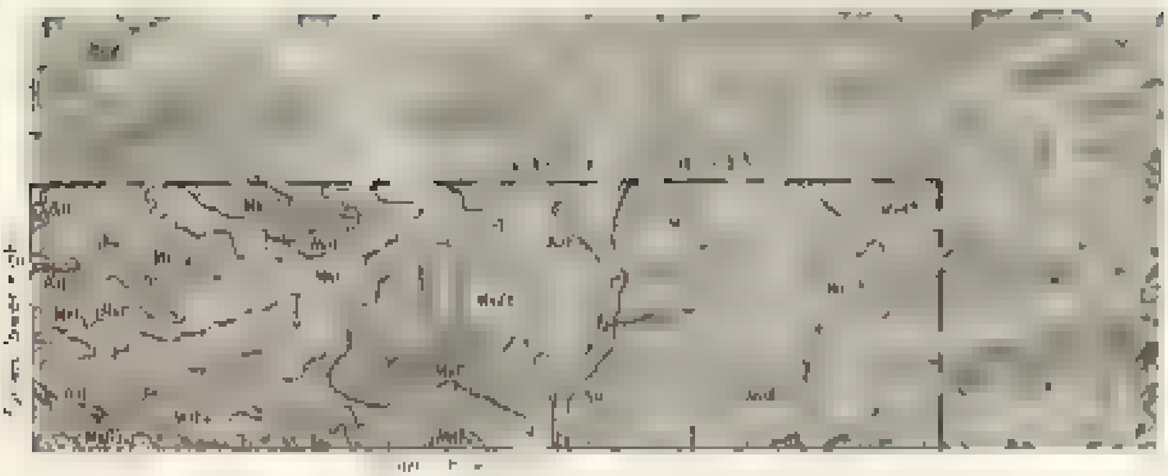

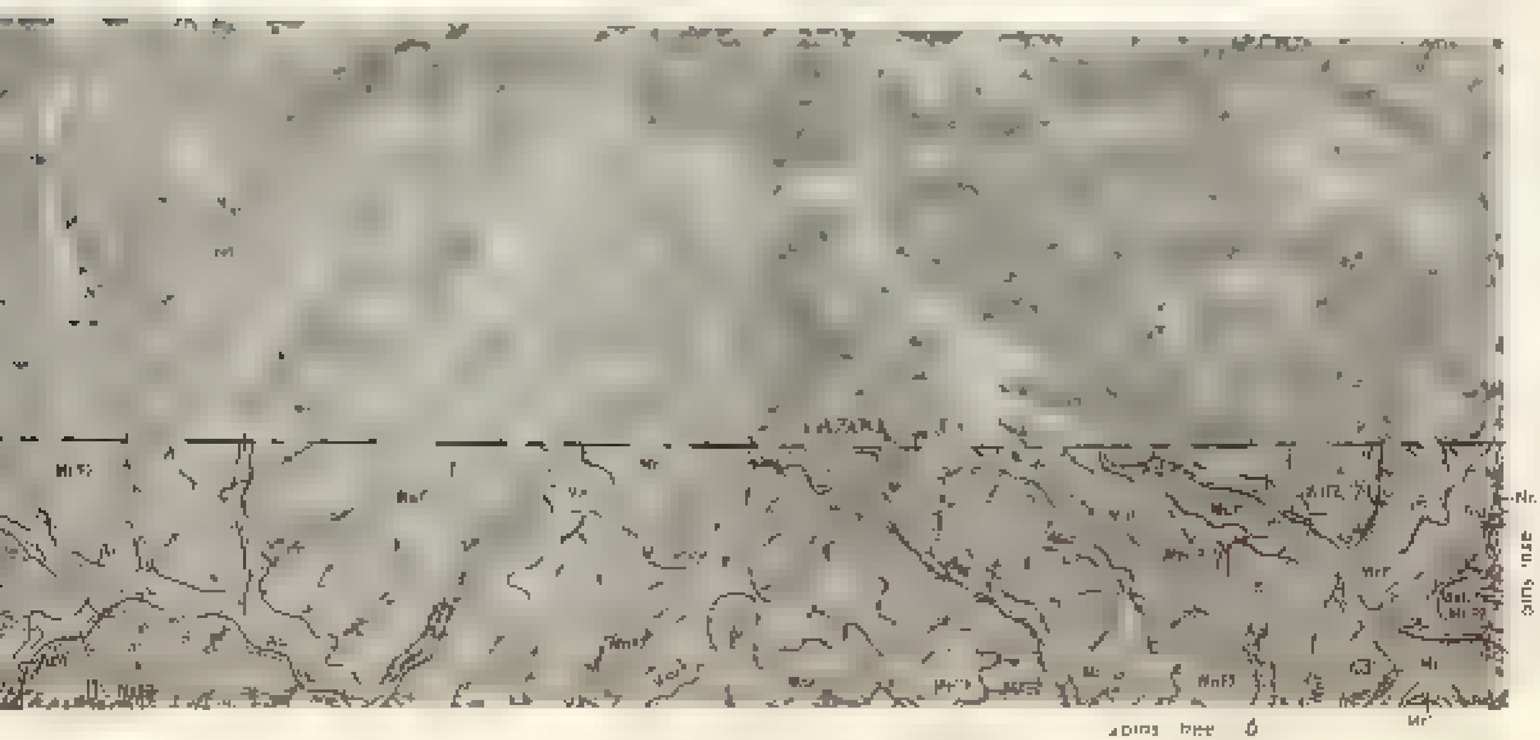

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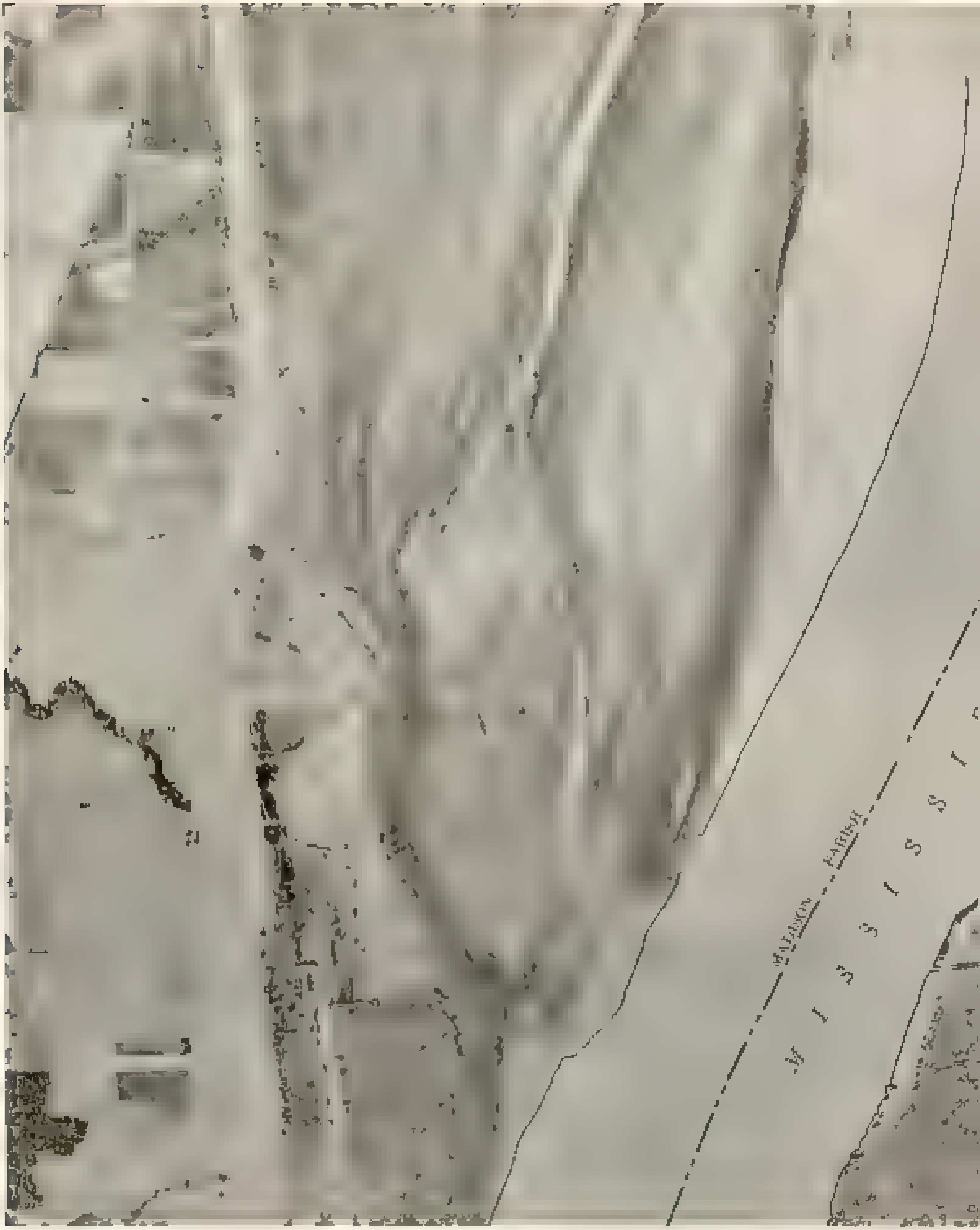
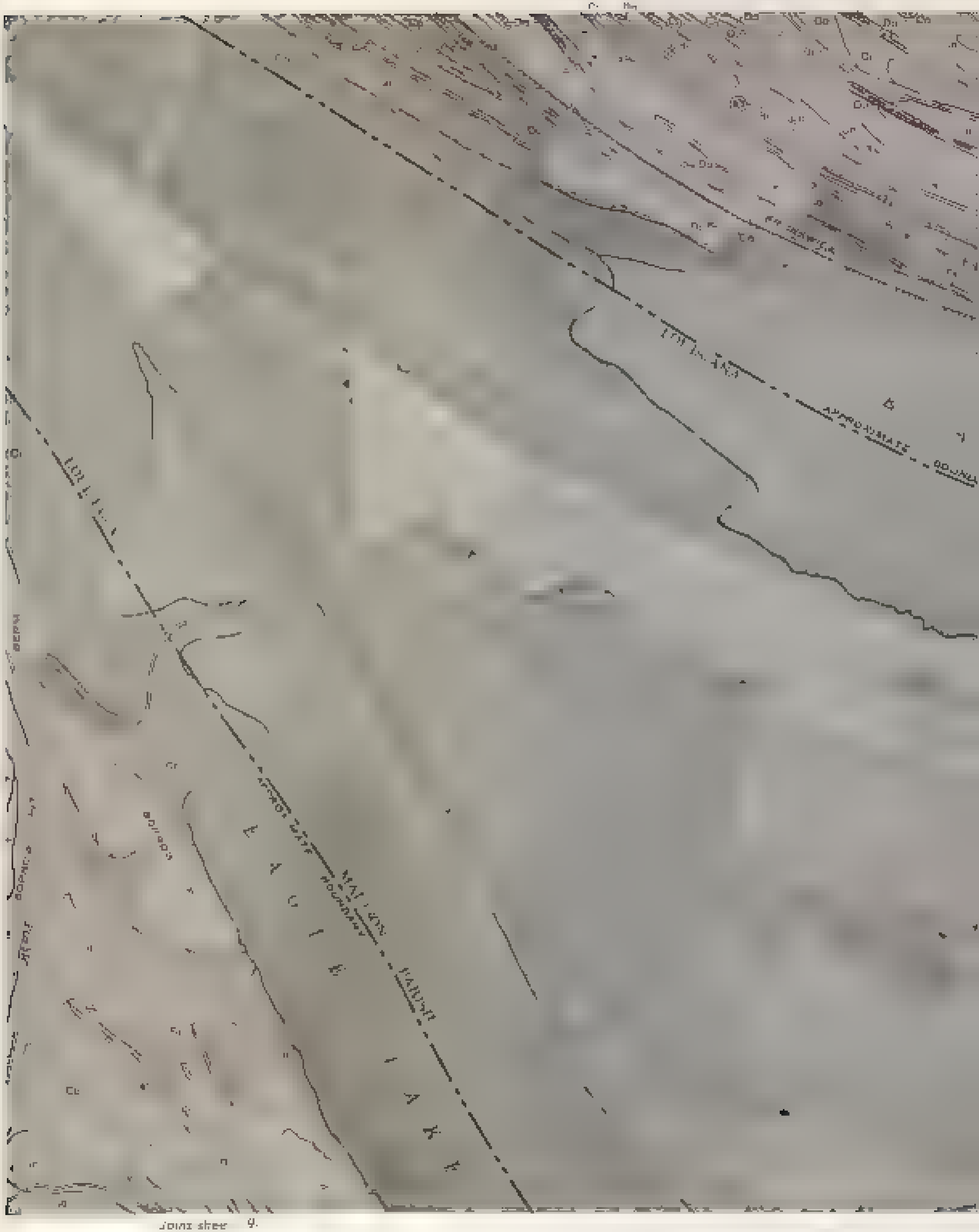


Joins sheet 3

Joins sheet 11

Joins sheet 8


LOUISIANA
APPROXIMATE BOUNDARY
APPROXIMATE BOUNDARY
MADISON PARISH
LAKE
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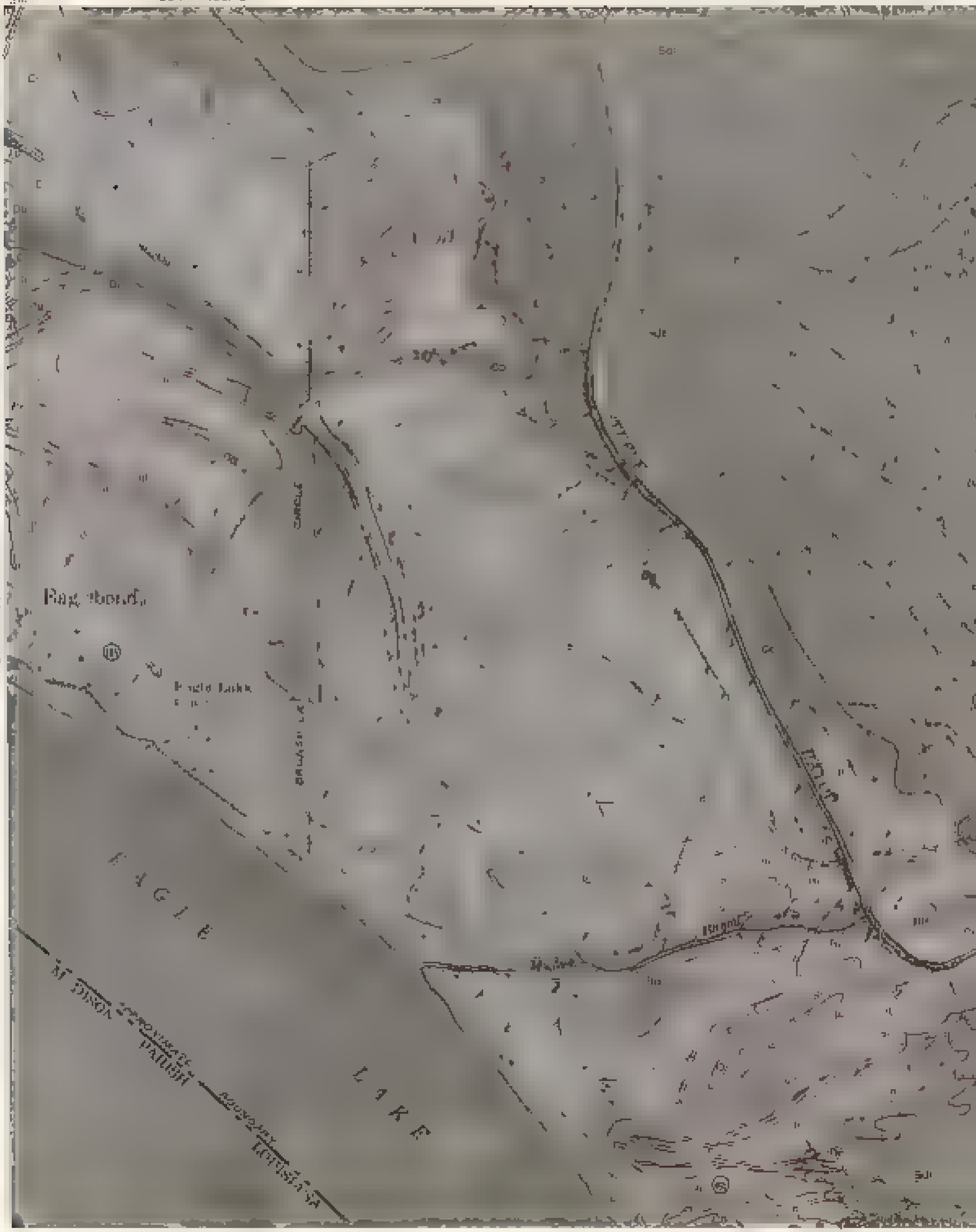
Joins sheet 9

SS SS PPI — SHEET NUMBER 11

Joins sheet 5



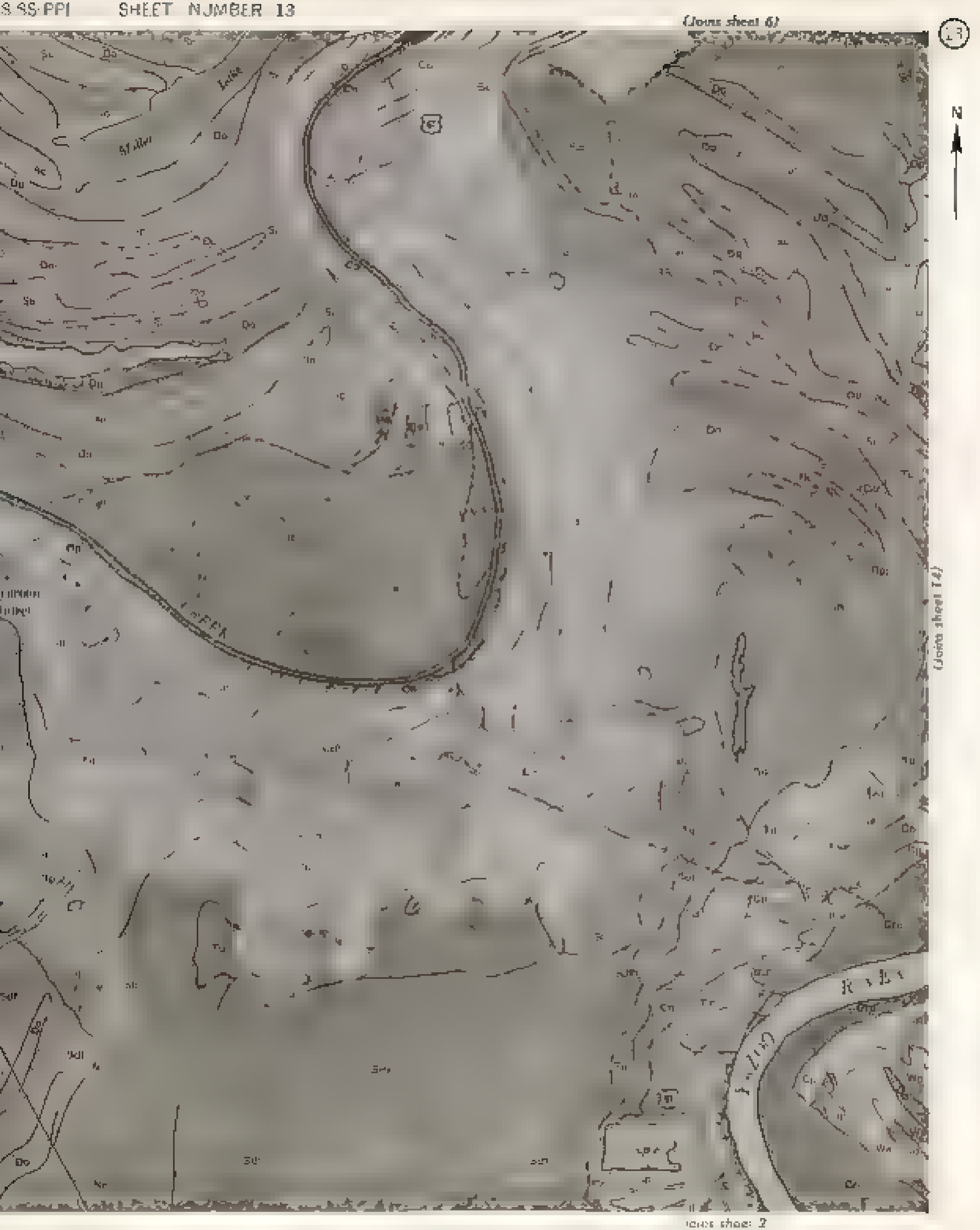
Joins sheet 11

Joins sheet 20

ISSISSIPPI — SHEET NUMBER 12

1


ISSAQUENA COUNTY
CENTRAL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13
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(Joins sheet 14)
Joins sheet 2

Joins sheet 7

Joins sheet 22

Joins sheet 15

(Join sheet 14)

SSIPPI SHEET NUMBER 15


16
(Joins sheet 9)
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(Joins sheet 16)
YAZOO COUNTY
(Joins sheet 25)

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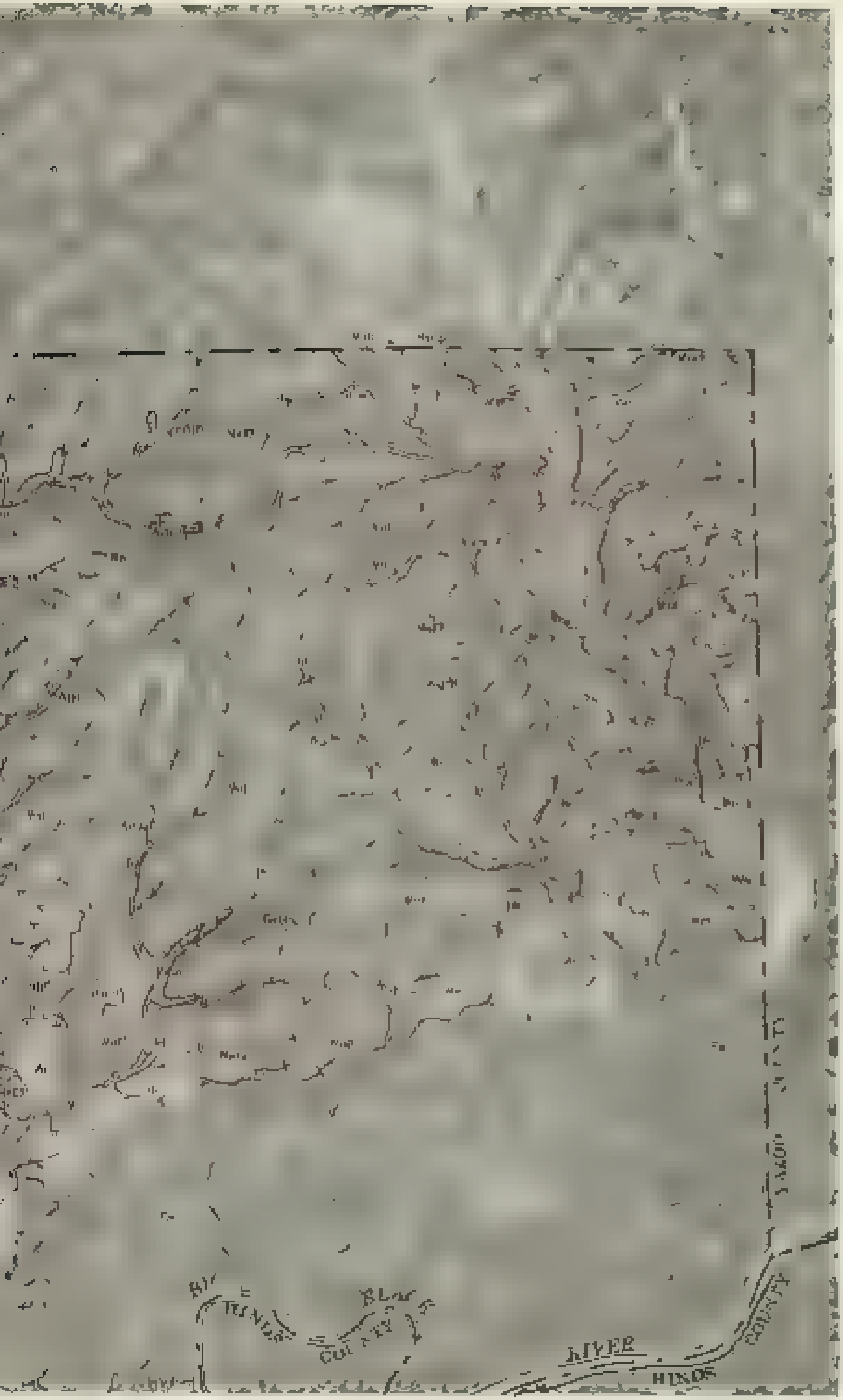


N
MISSISSIPPI RIVER

MISSISSIPPI SHEET NUMBER 18

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MADISON PARISH
E A G L E


19
N
PARISH
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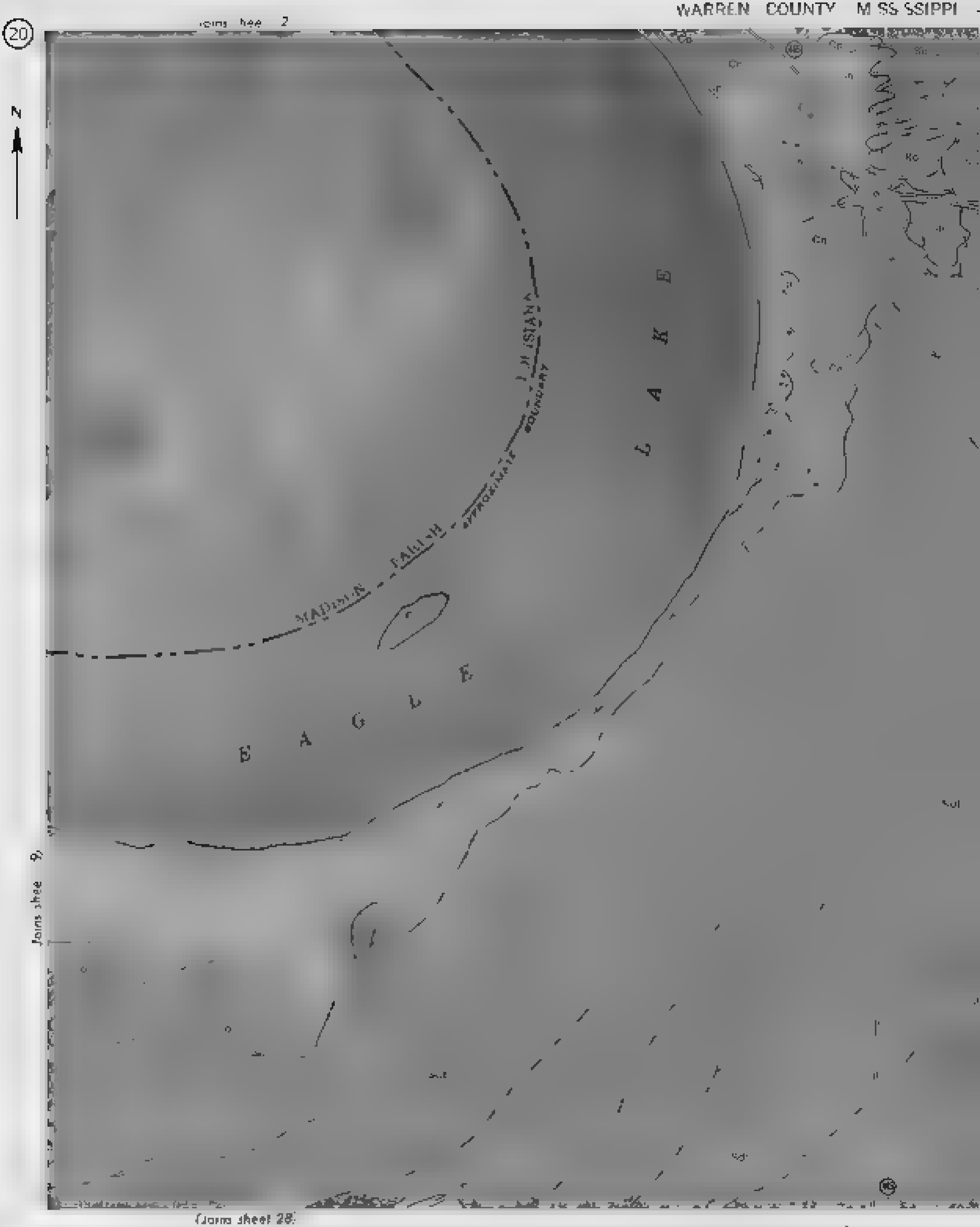
LOUISIANA
L A K E
(Join sheet 20)
(Join sheet 27)

20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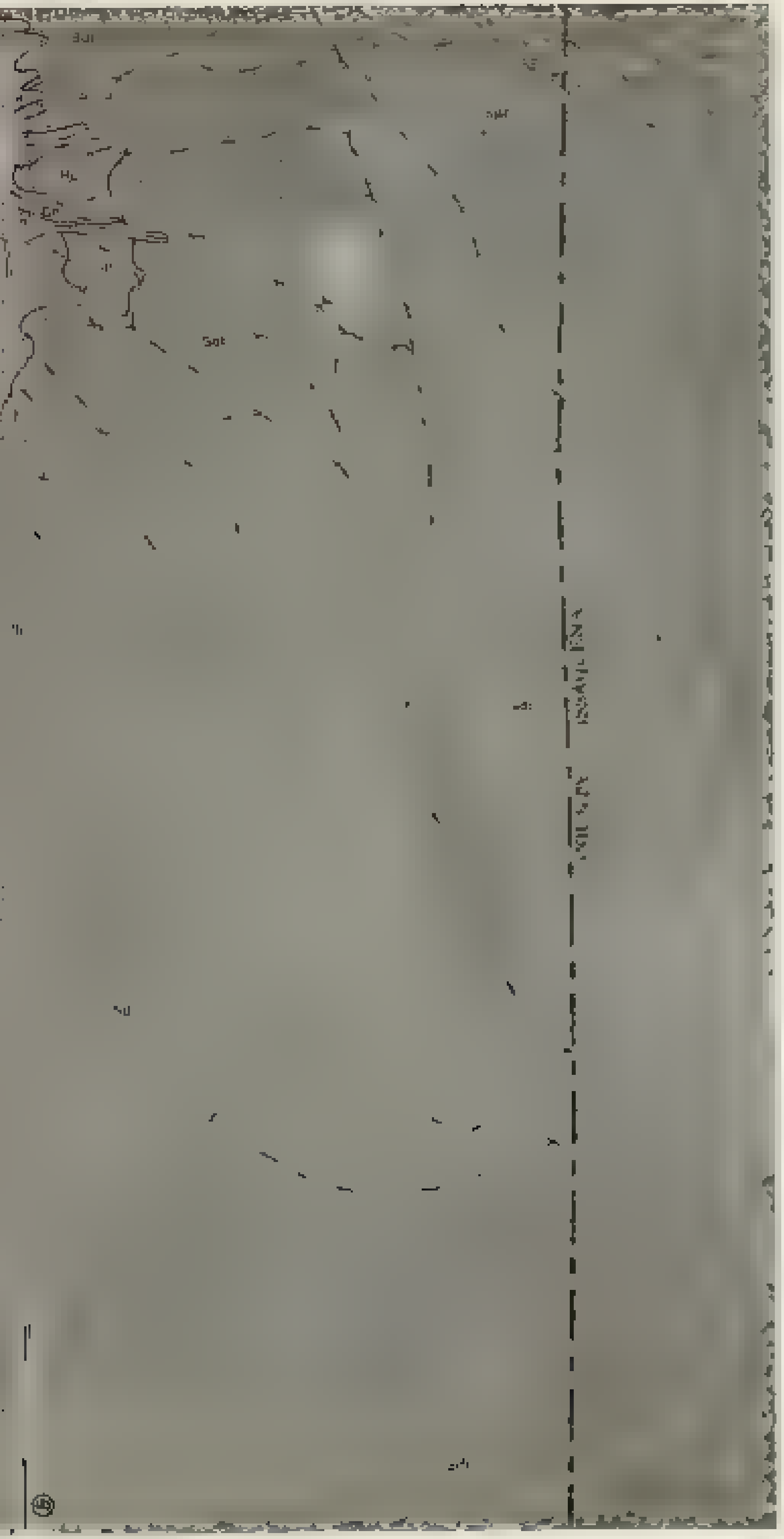
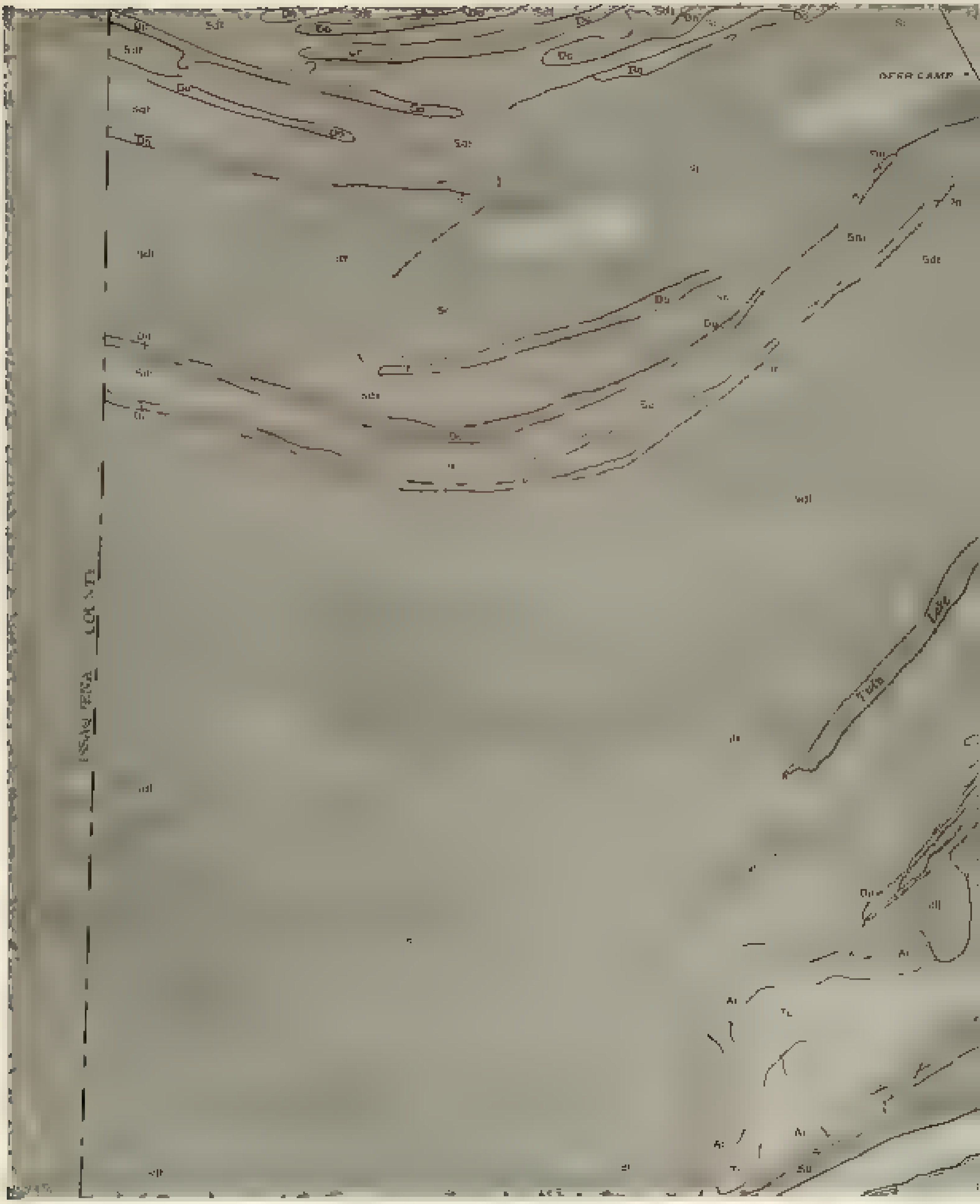
MADISON PARISH
LOUISIANA
APPROXIMATE BOUNDARY
Joins sheet 9
Joins sheet 28

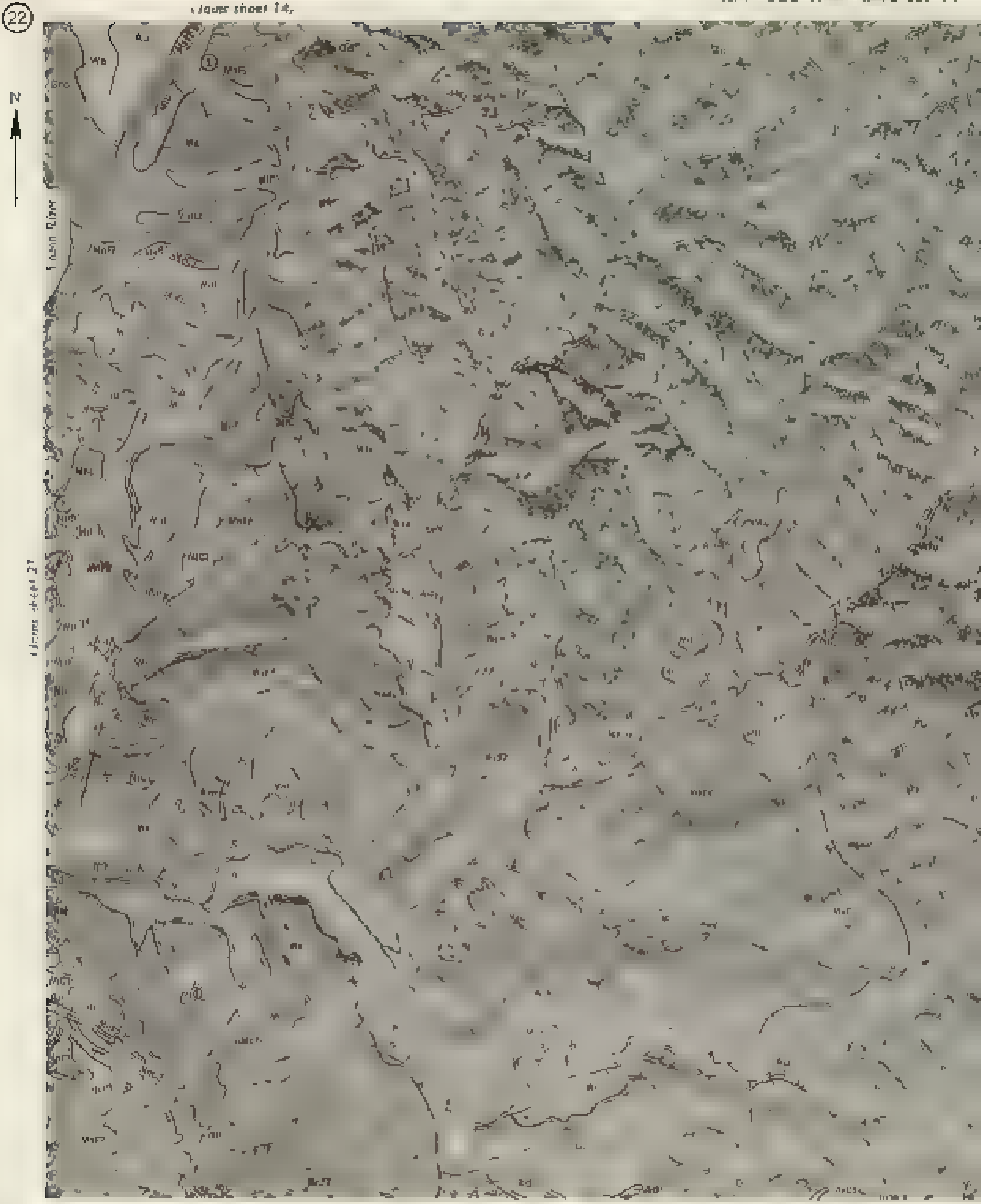
MISS SS PPI — SHEET NUMBER 20




DEER CAMP
ISSAQUENA COUNTY


(Joins sheet 3)
21
N
DEER CAMP
CLUBHOUSE
Twin Lake
RIVER
YAZOO
Redwood
(Joins sheet 22)
Joins sheet 30
Joins sheet 31

22



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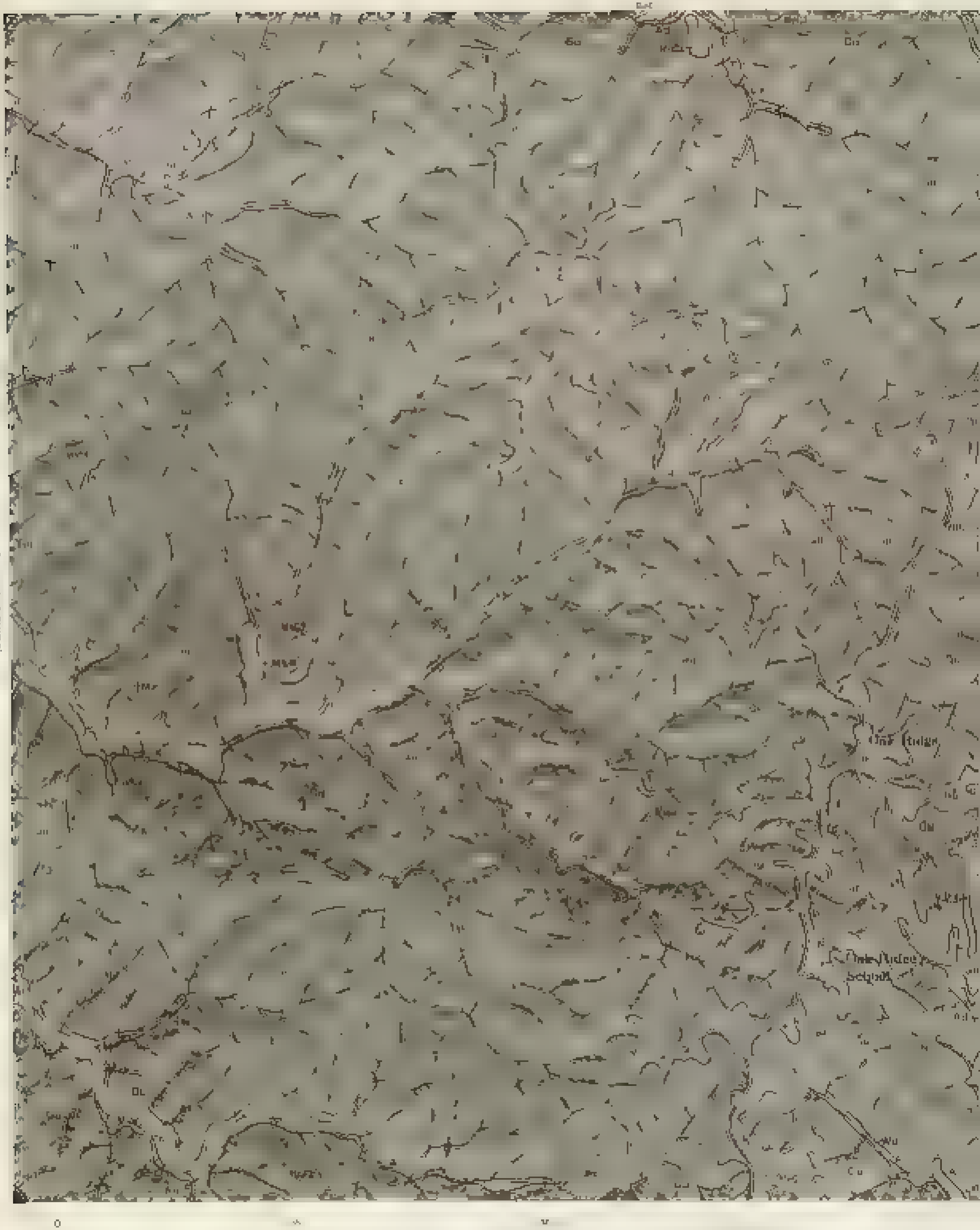
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23

(Joins sheet 32) | (Joins sheet 33)

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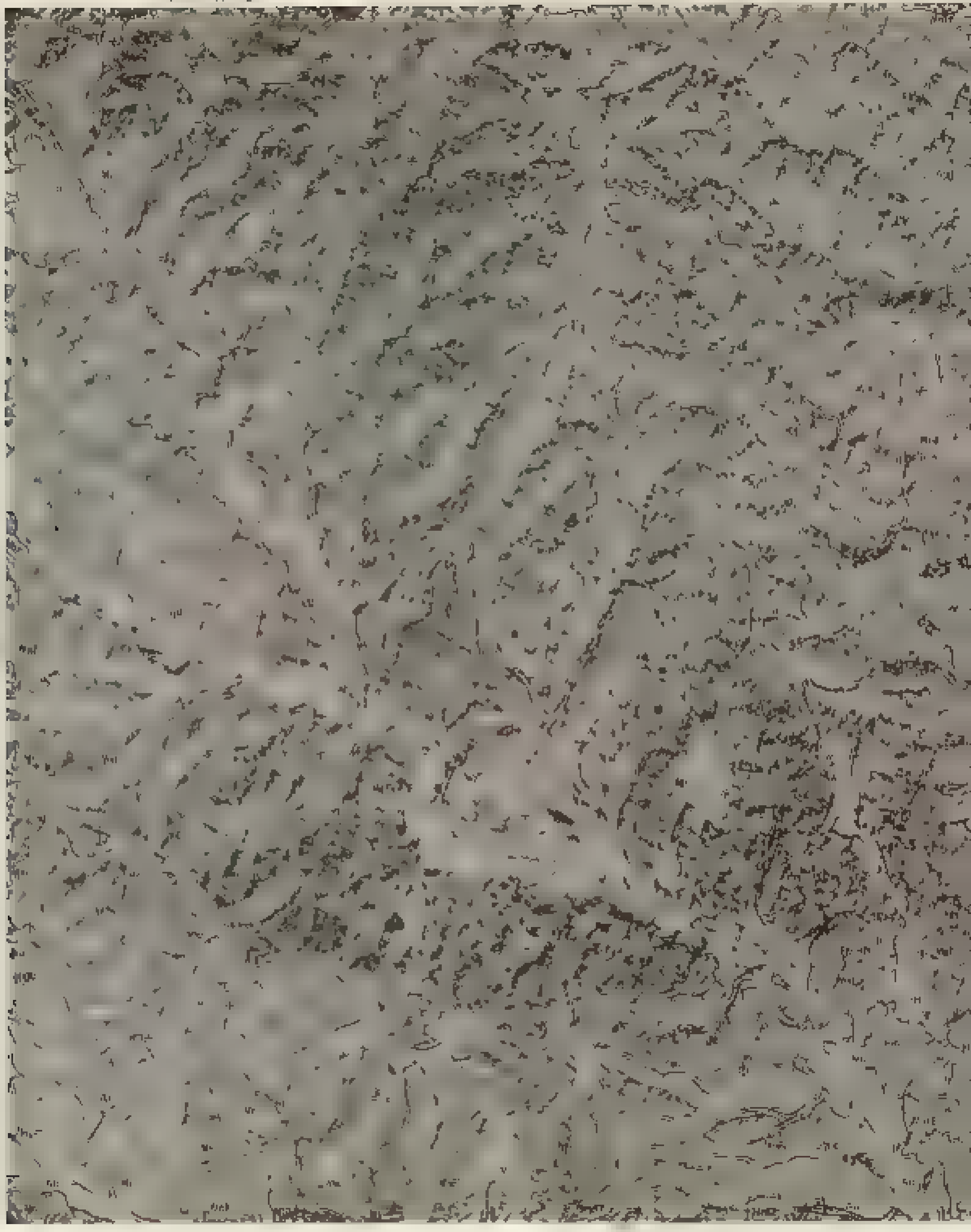

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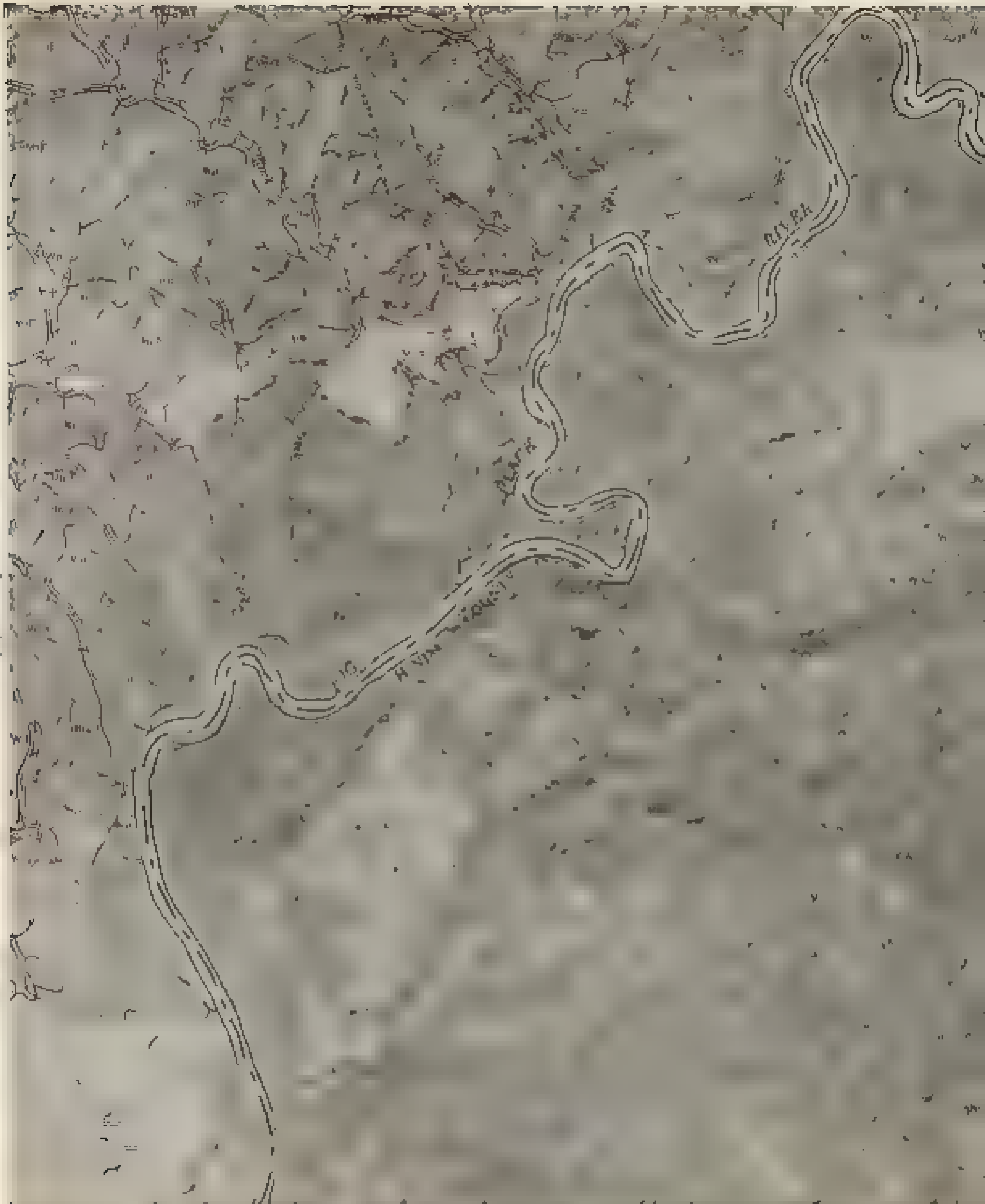

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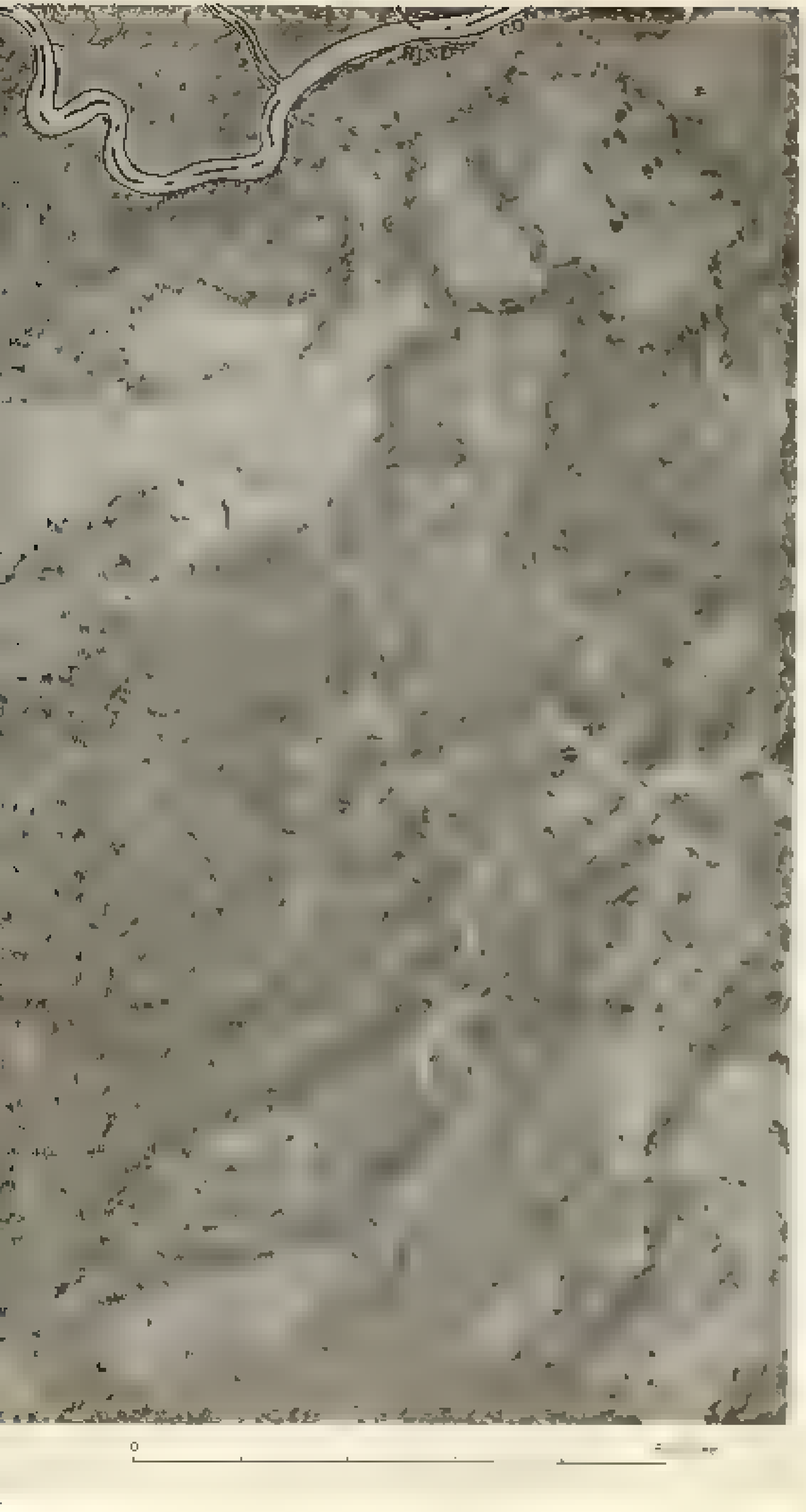

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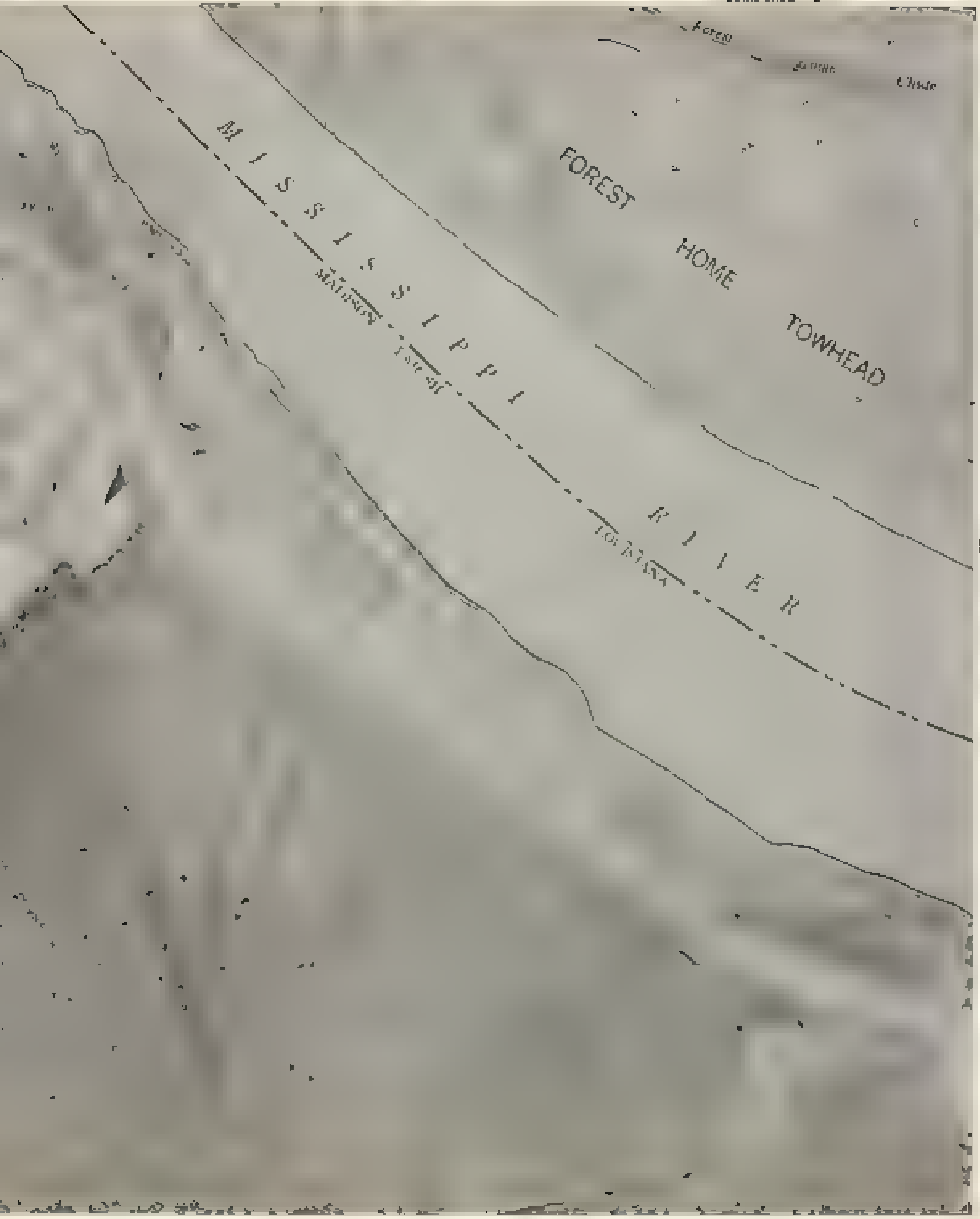

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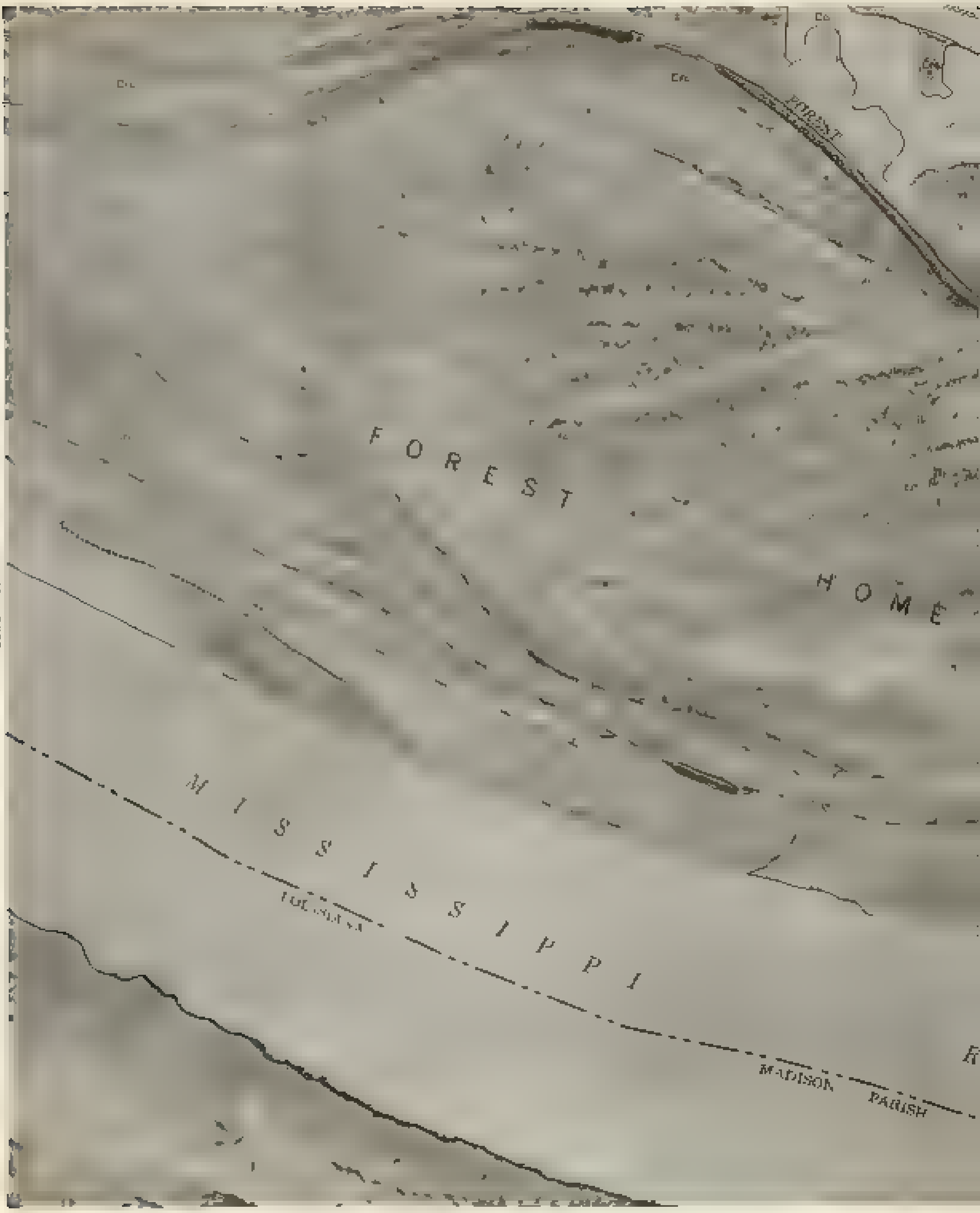
Joins sheet 26



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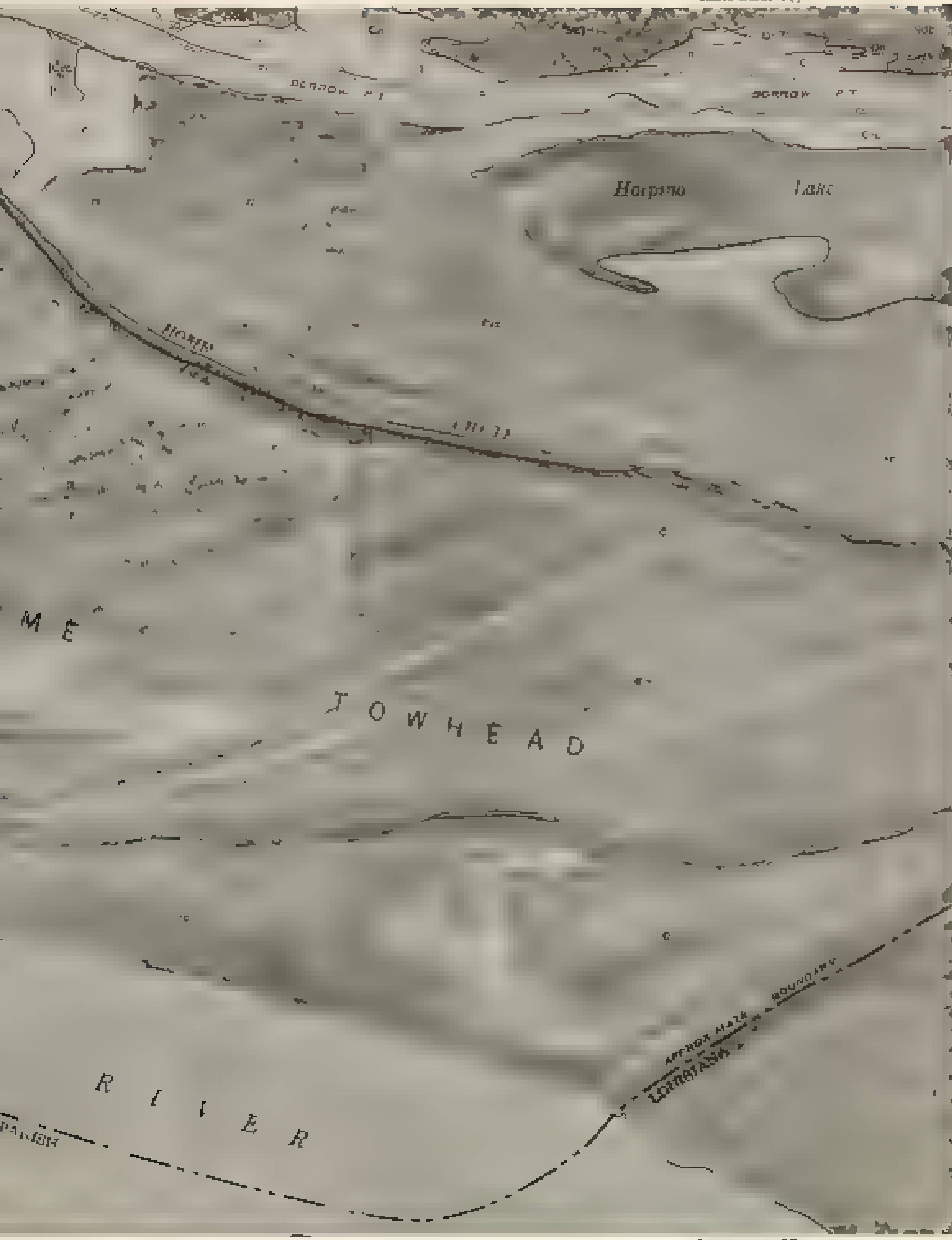

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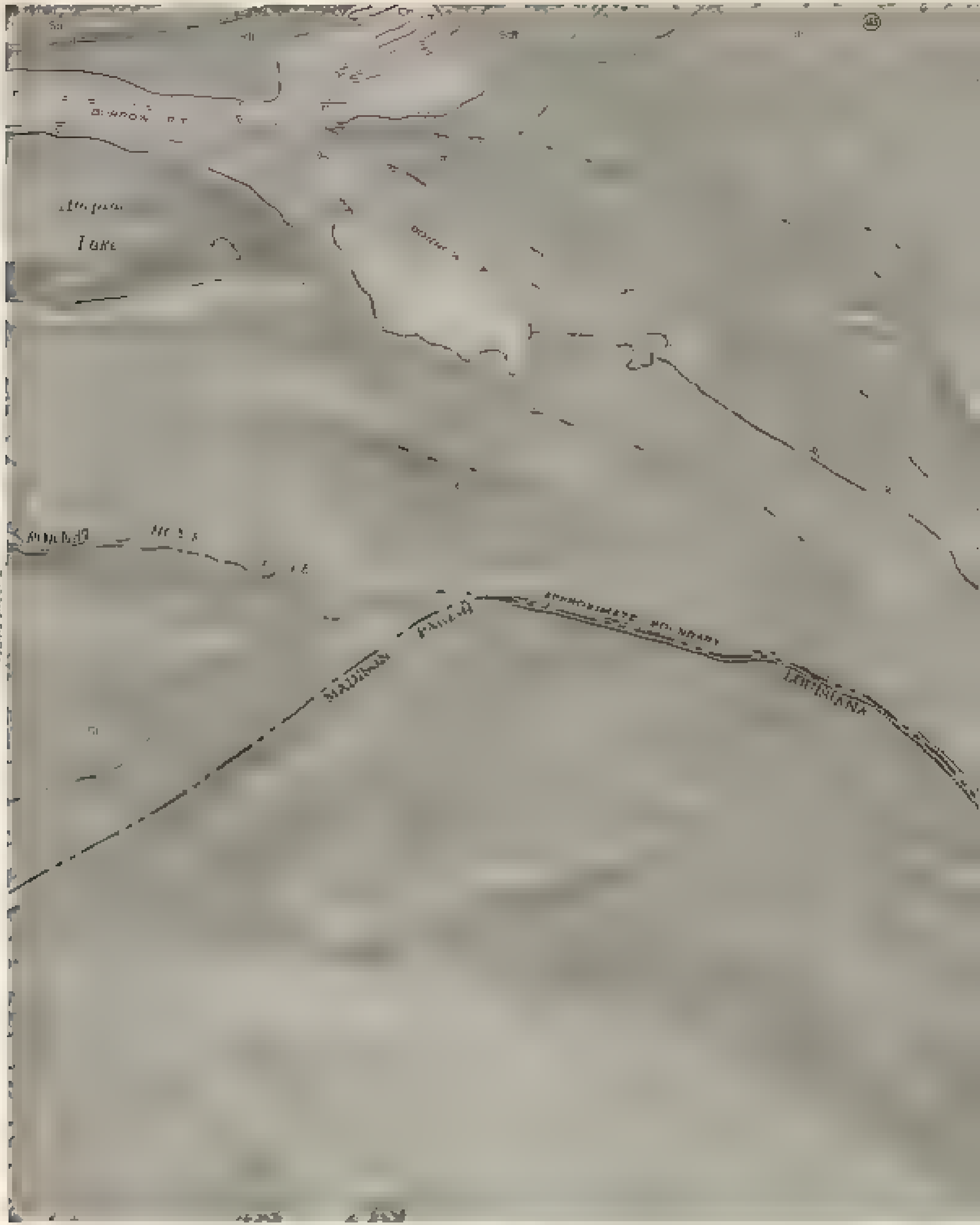
(Joins sheet 35)

Joins sheet 20

Joins sheet 27



Joins sheet 29

(Joins sheet 35) | (Joins sheet 36)

Joins sheet 28

(29)

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Joins sheet 30

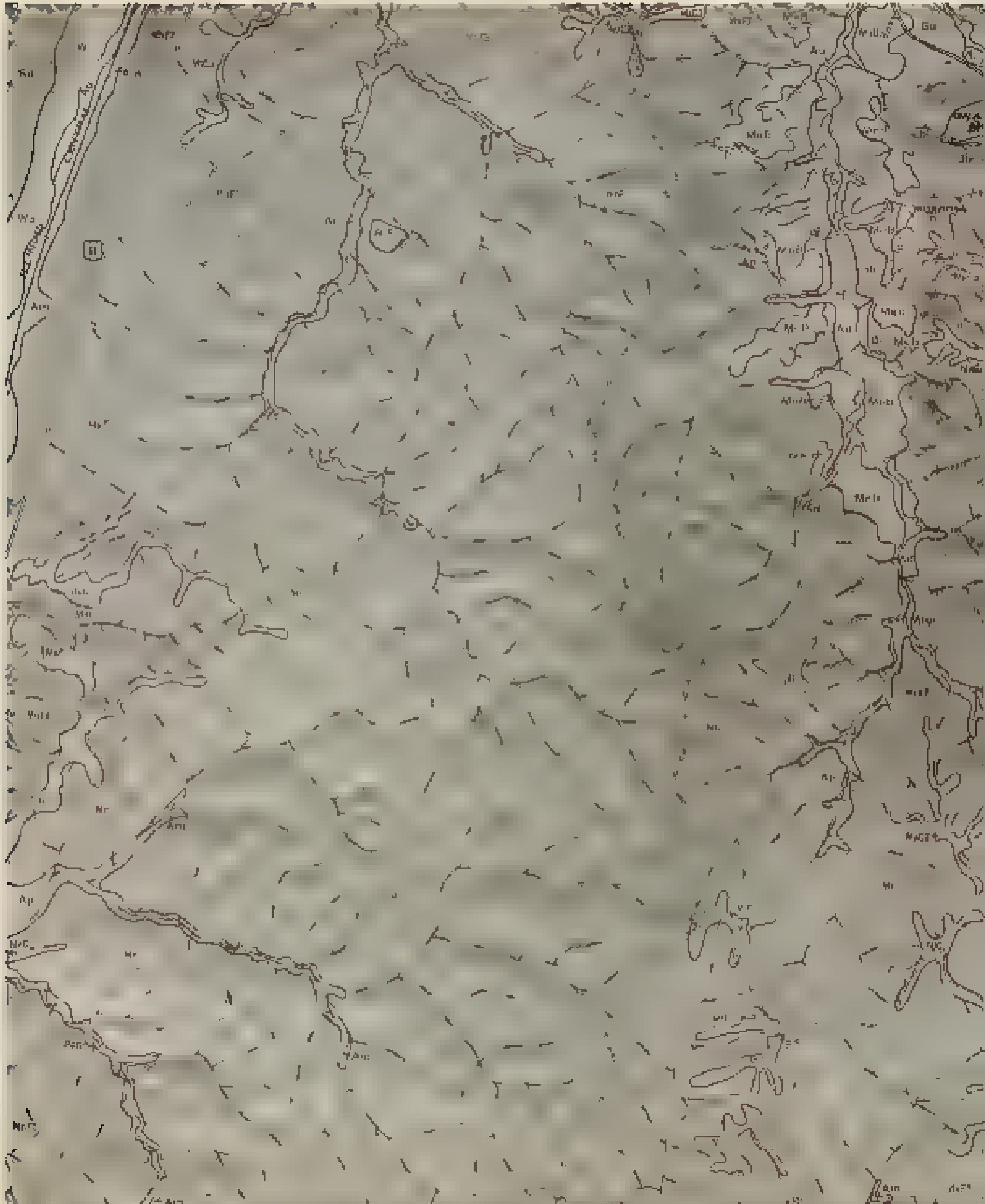
Joins sheet 36 Joins sheet 37

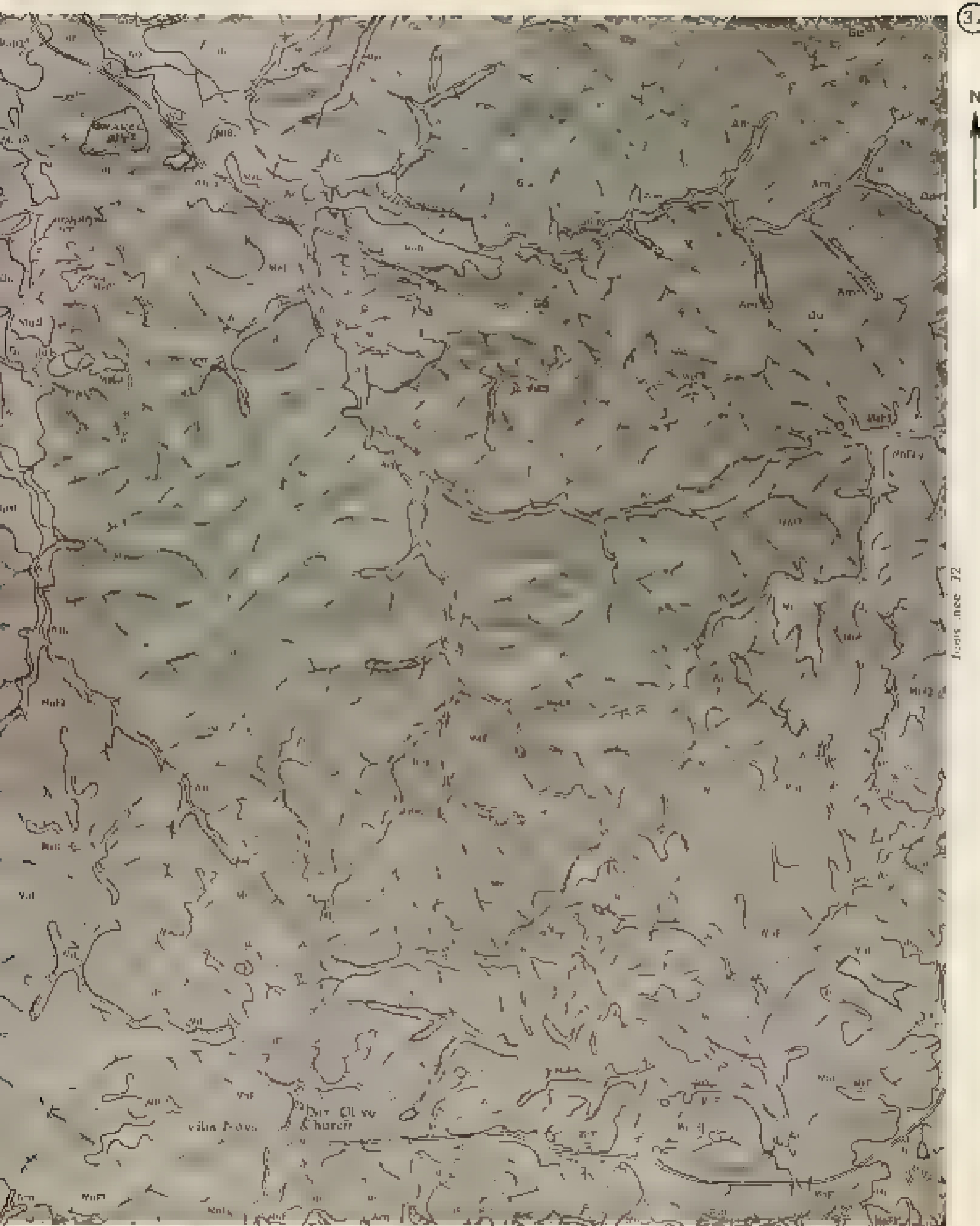

N
Joins sheet 29


Joins sheet 2
Joins sheet 3
Joins sheet 37
Joins sheet 38
Sdr
Ar
Thompson
ILLINOIS CENTRAL
BORROW PIT

(Joins sheet 21) | (Joins sheet 22)

(Joins sheet 30)

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Church

32

(Joins sheet 22) (Joins sheet 23)

(Joins sheet 31)

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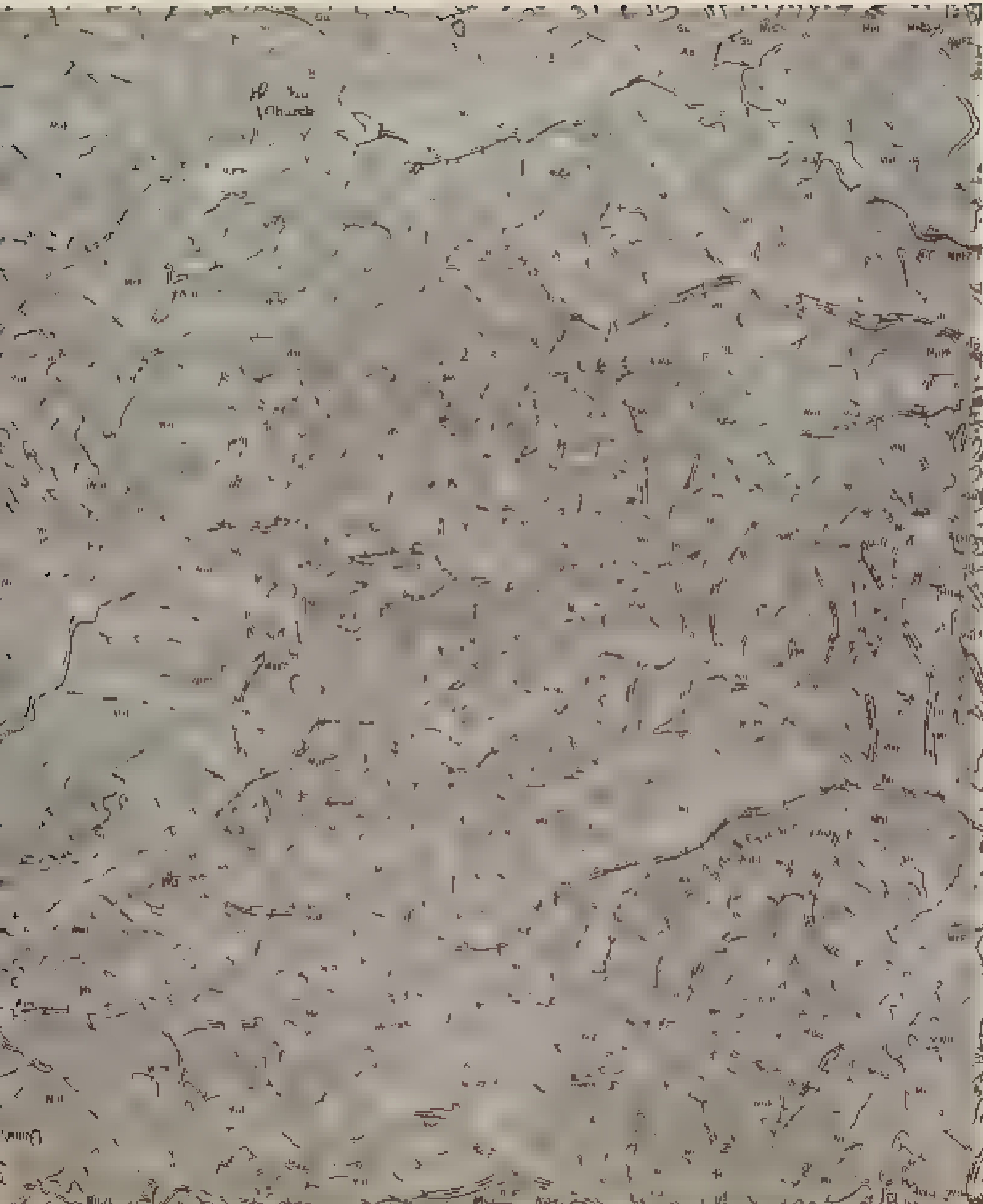

sheet 39 40

(Joins sheet 23) | (Joins sheet 24)

33

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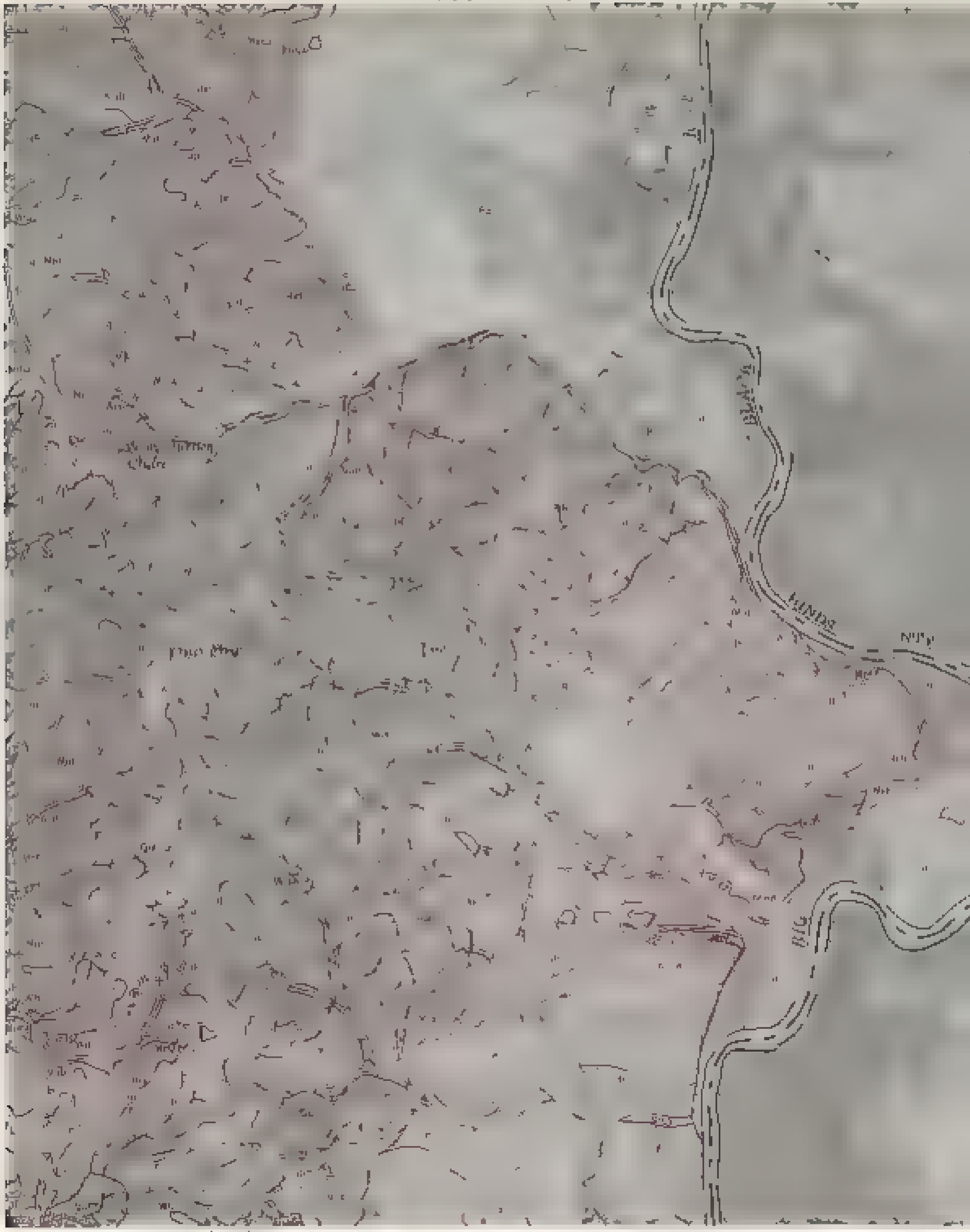
Joins sheet 33



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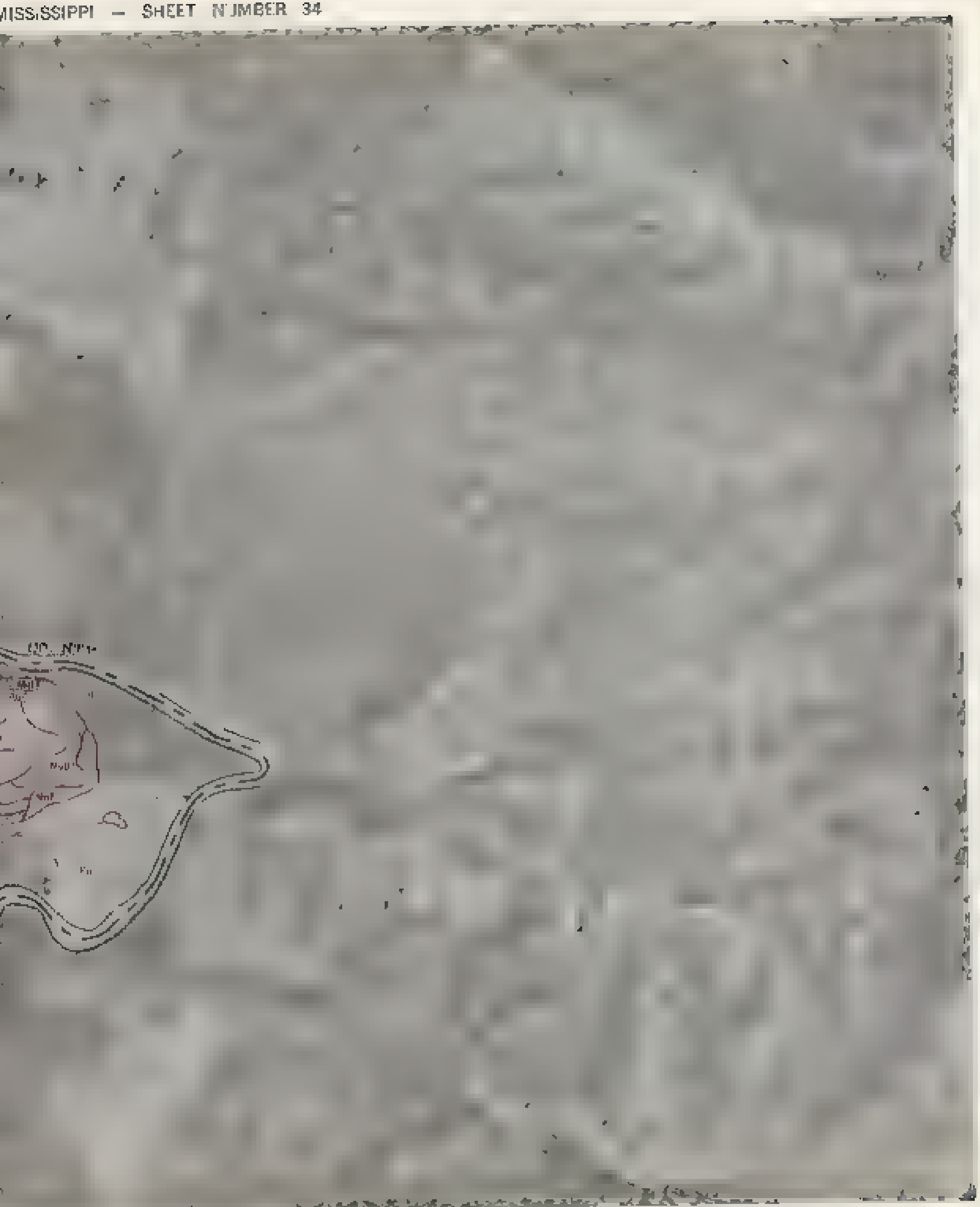


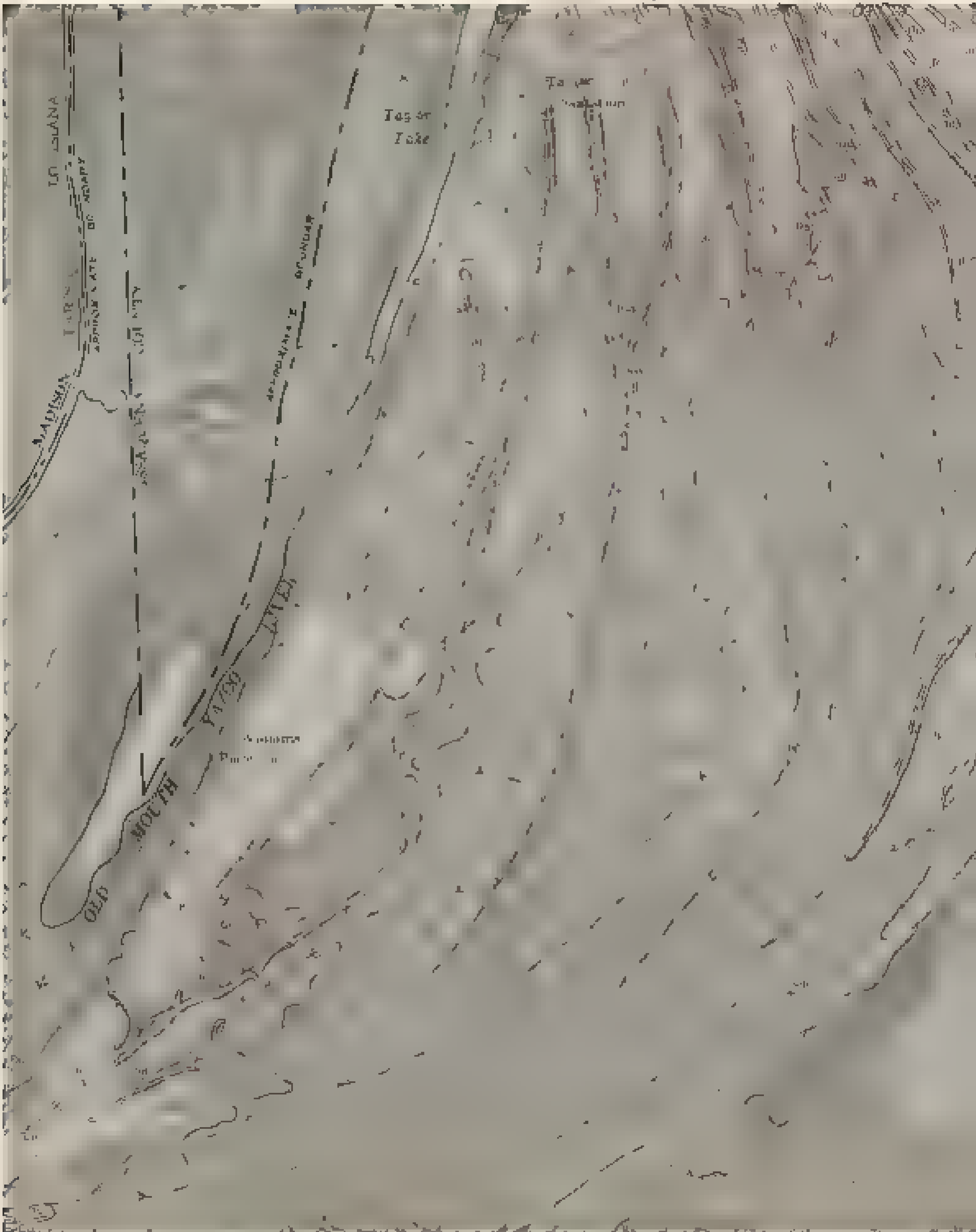
WARREN COUNTY MIS

(Jones sheet 27 Jones sheet 28)


N
LOUISIANA
APPROXIMATE BOUNDARY
(Joins sheet 36)
(Joins sheet 42)

(Joins sheet 28) | Joins sheet 29.

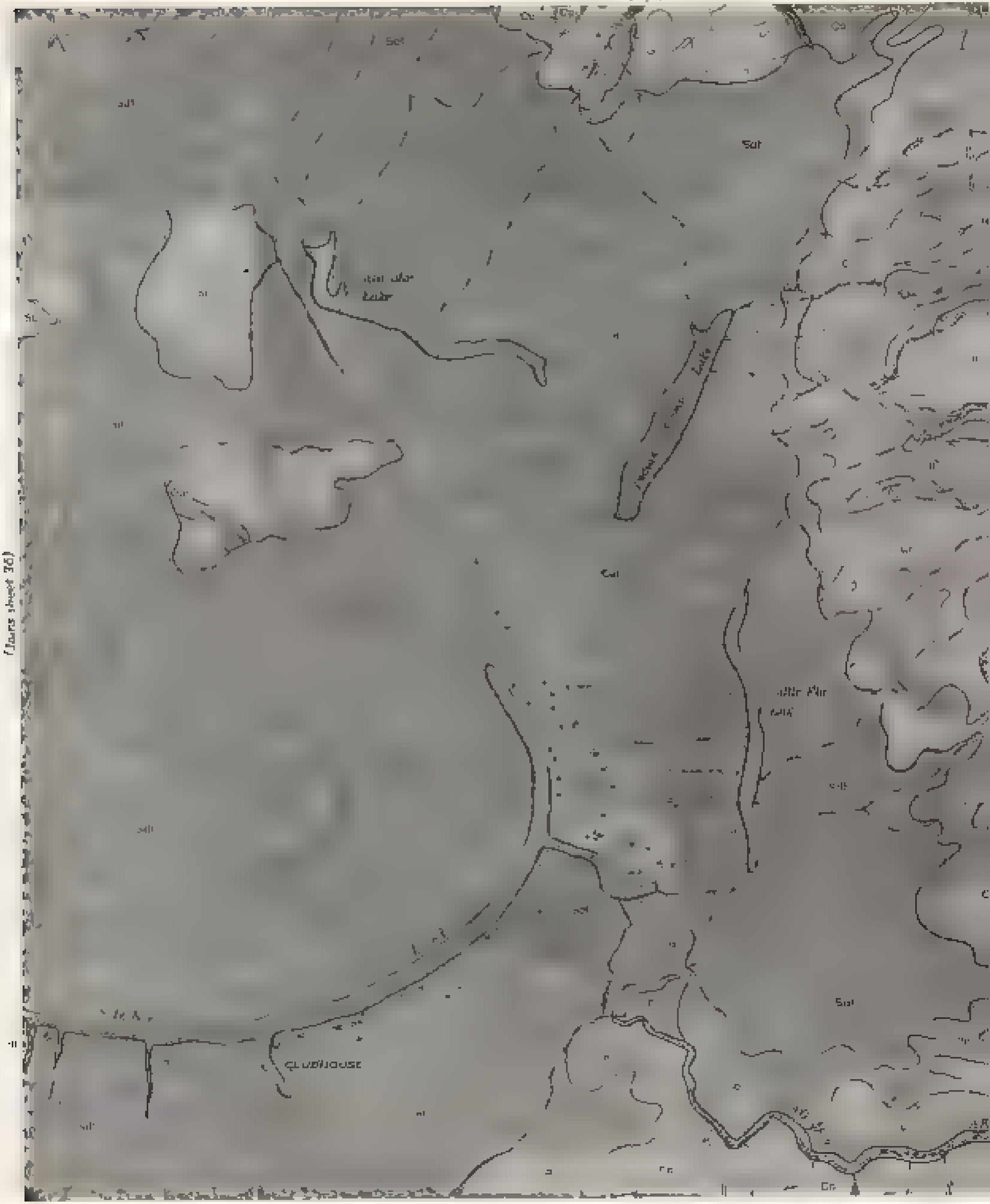
Joins sheet 35

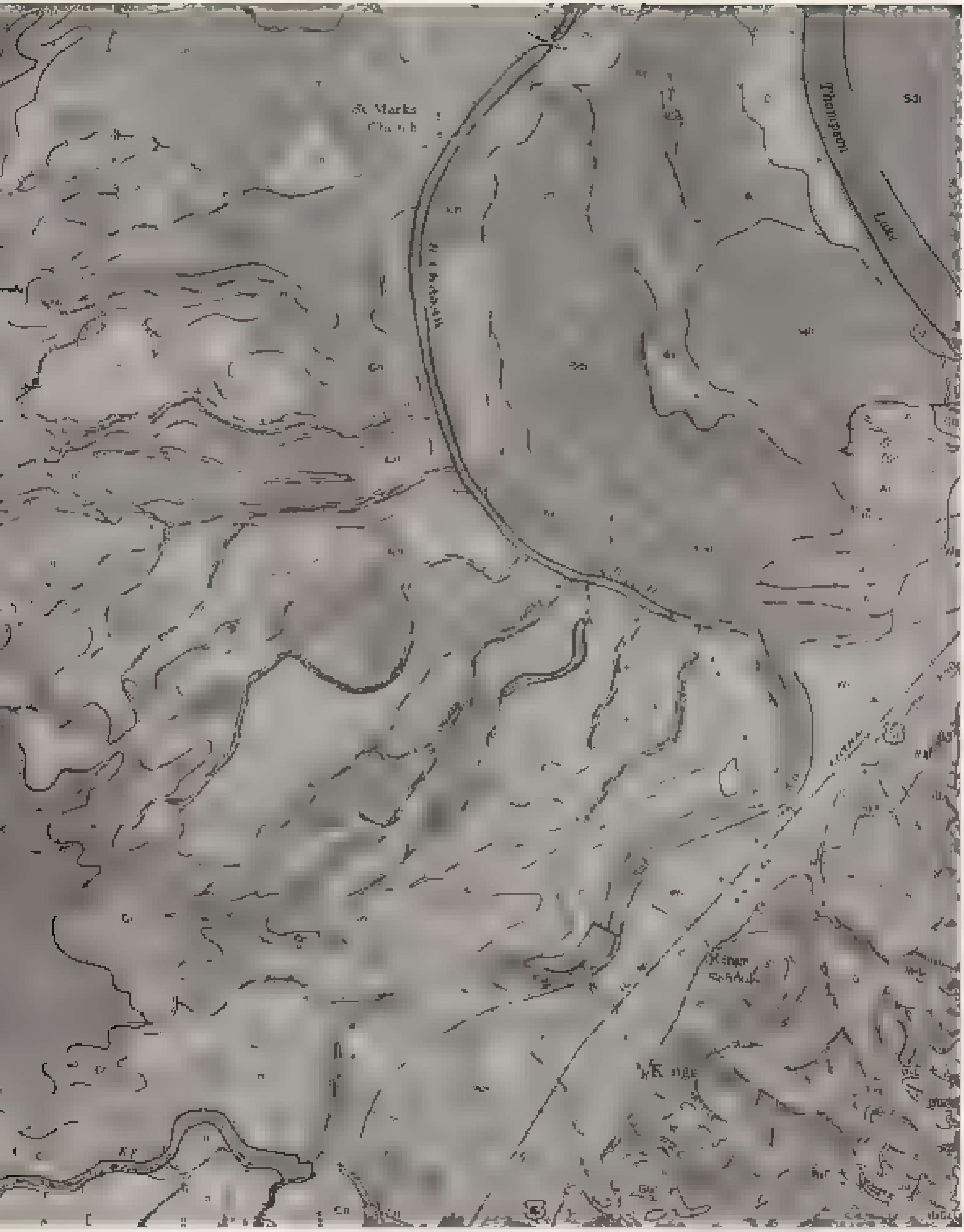


Joins sheet 43.

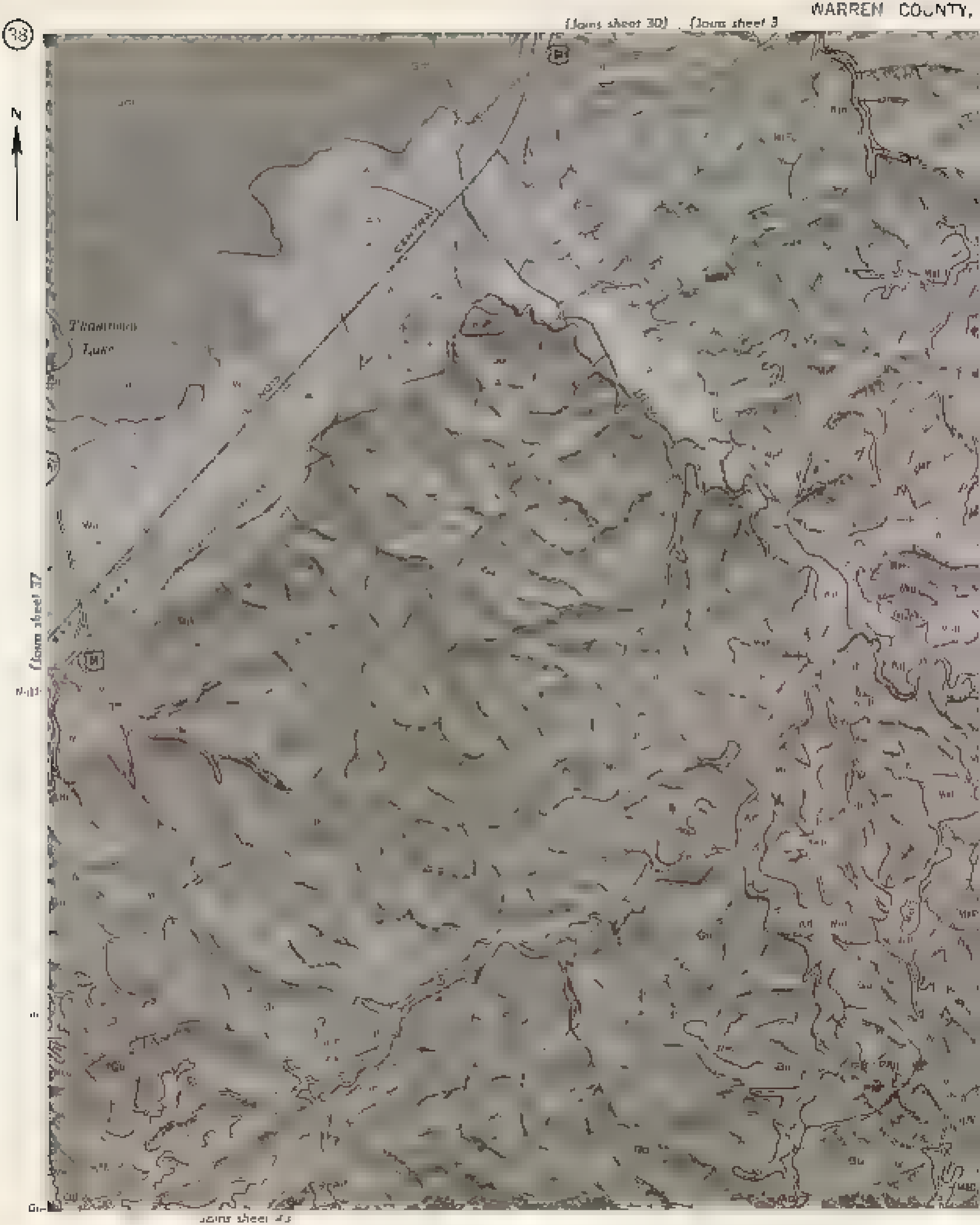

RIVER
YAZOO
BAYOU
FERRY
WILTON
BAKE
Joins sheet 37,

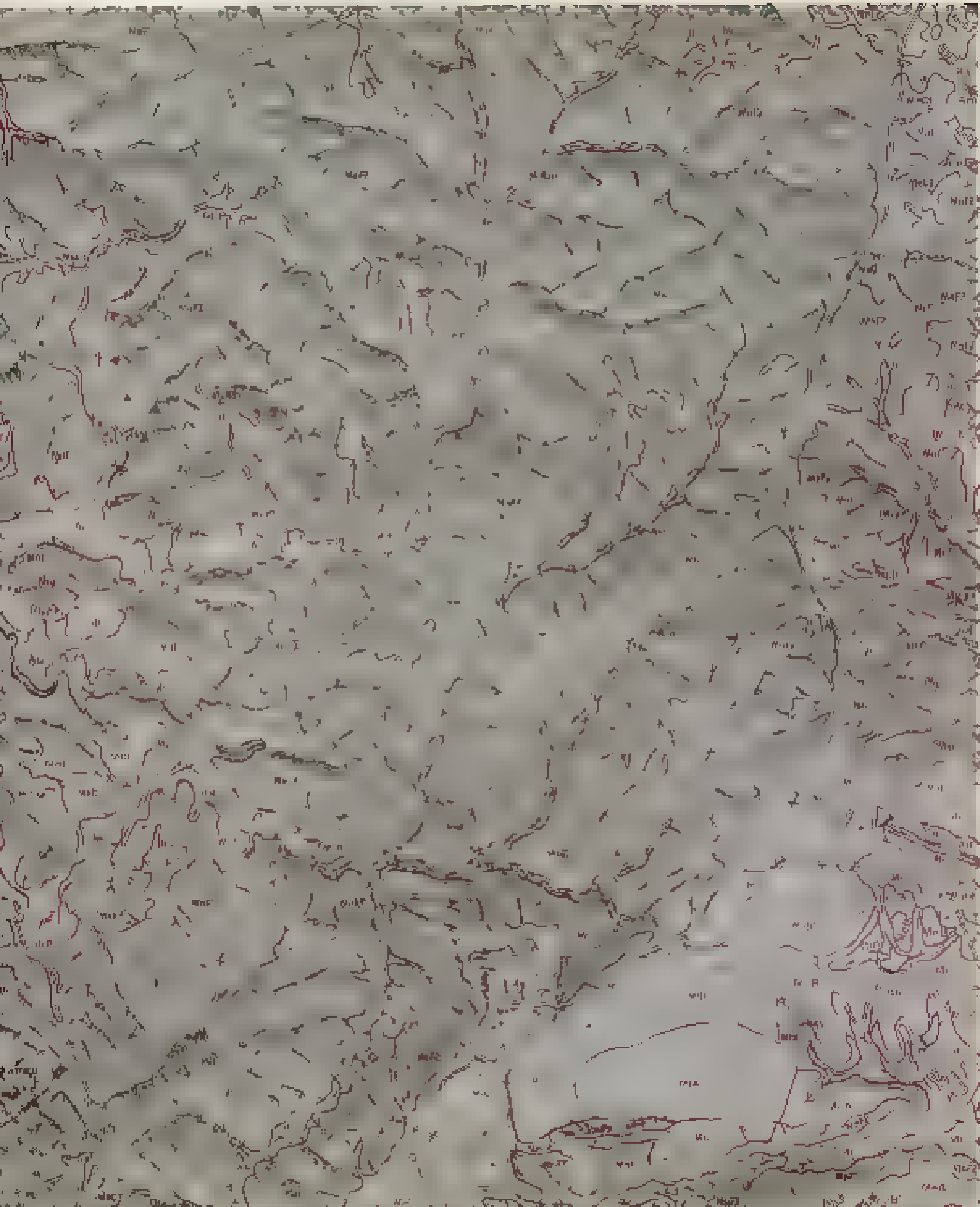
(Joins sheet 29) | (Joins sheet 30. WARREN COUNTY, MISS





Joins sheet 44.


(Joins sheet 30)
N
(Joins sheet 37)



39

Joins sheet 40

Joins sheet 46

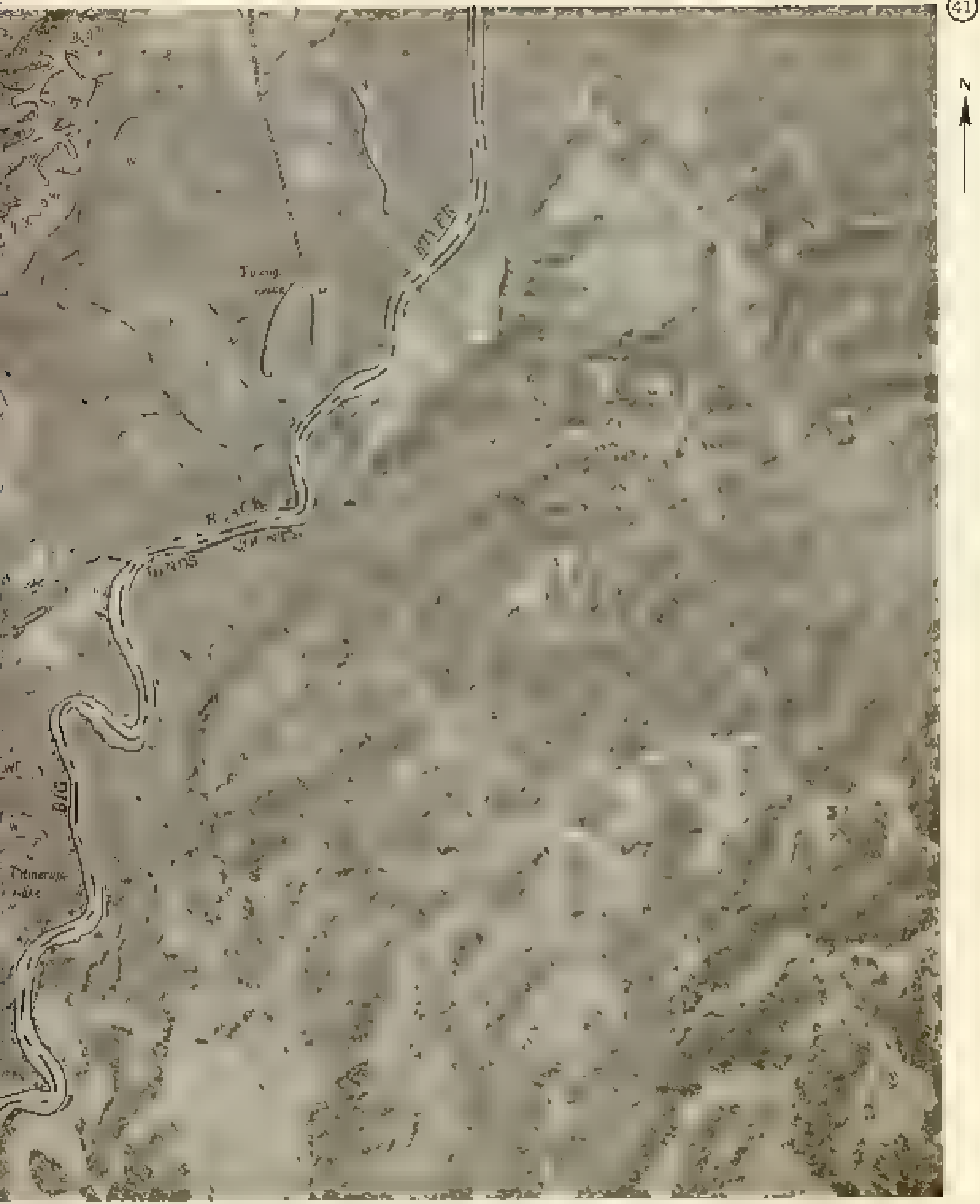
(Joins sheet 32) | Joins sheet 33

Joins sheet 39

(Joins sheet 47)

(Joins sheet 33) | (Joins sheet 34) WARREN COUNTY MI

heet 45

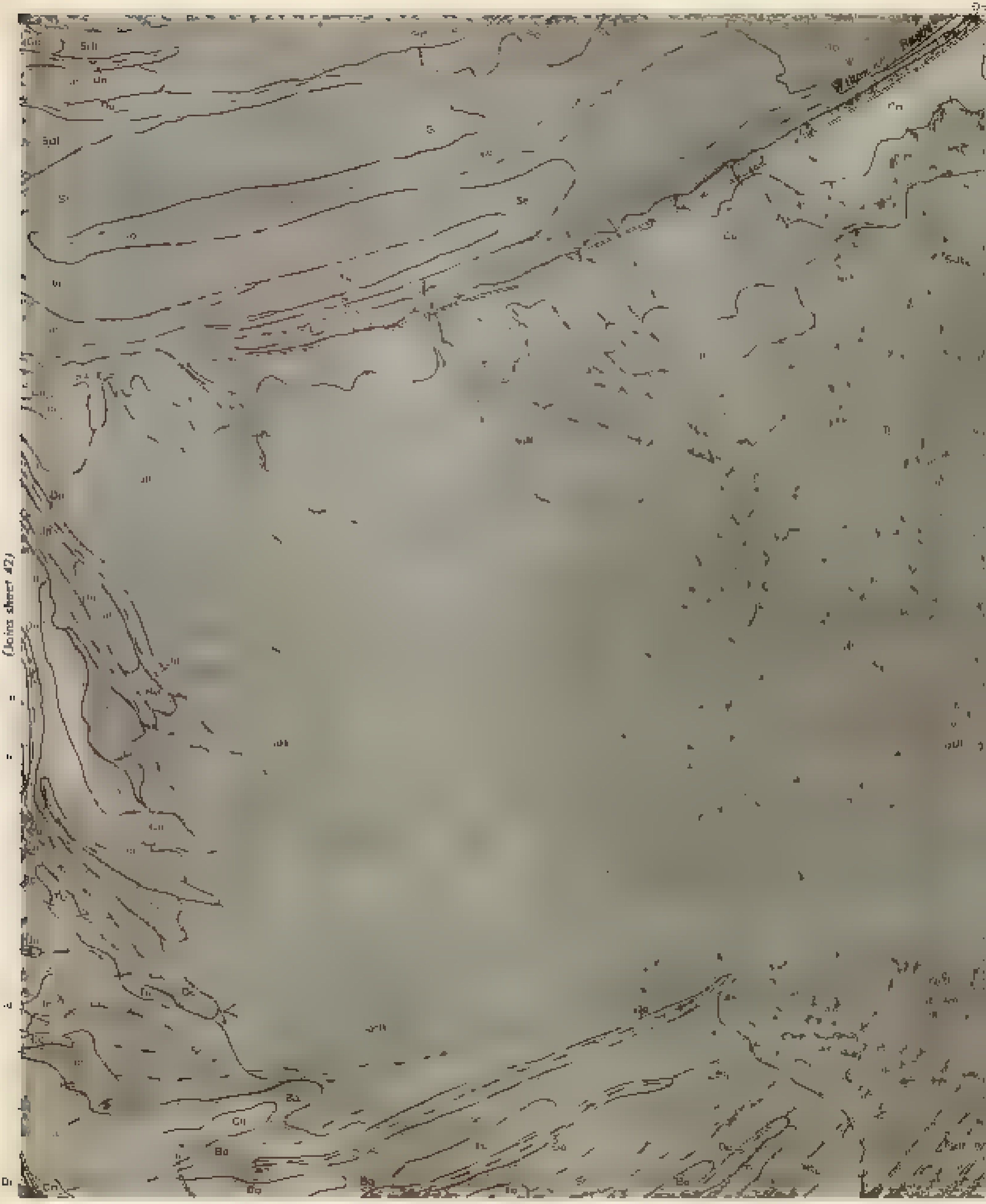

N
RIVER
BLACK
BIG

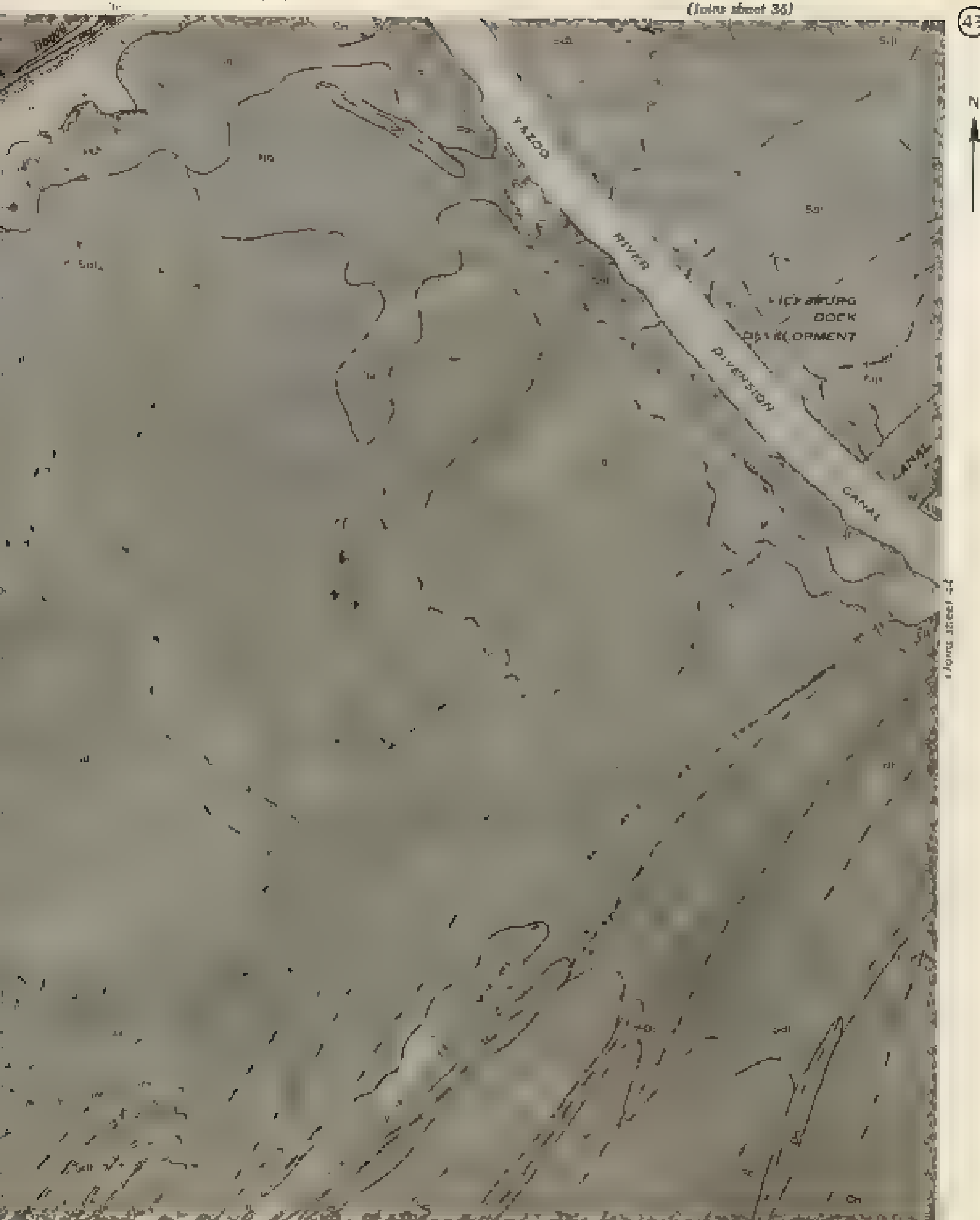

N
MADISON PARISH
MISSISSIPPI

(Joins sheet 35)

Joins sheet 43

Joins sheet 49


(Joins sheet 42)

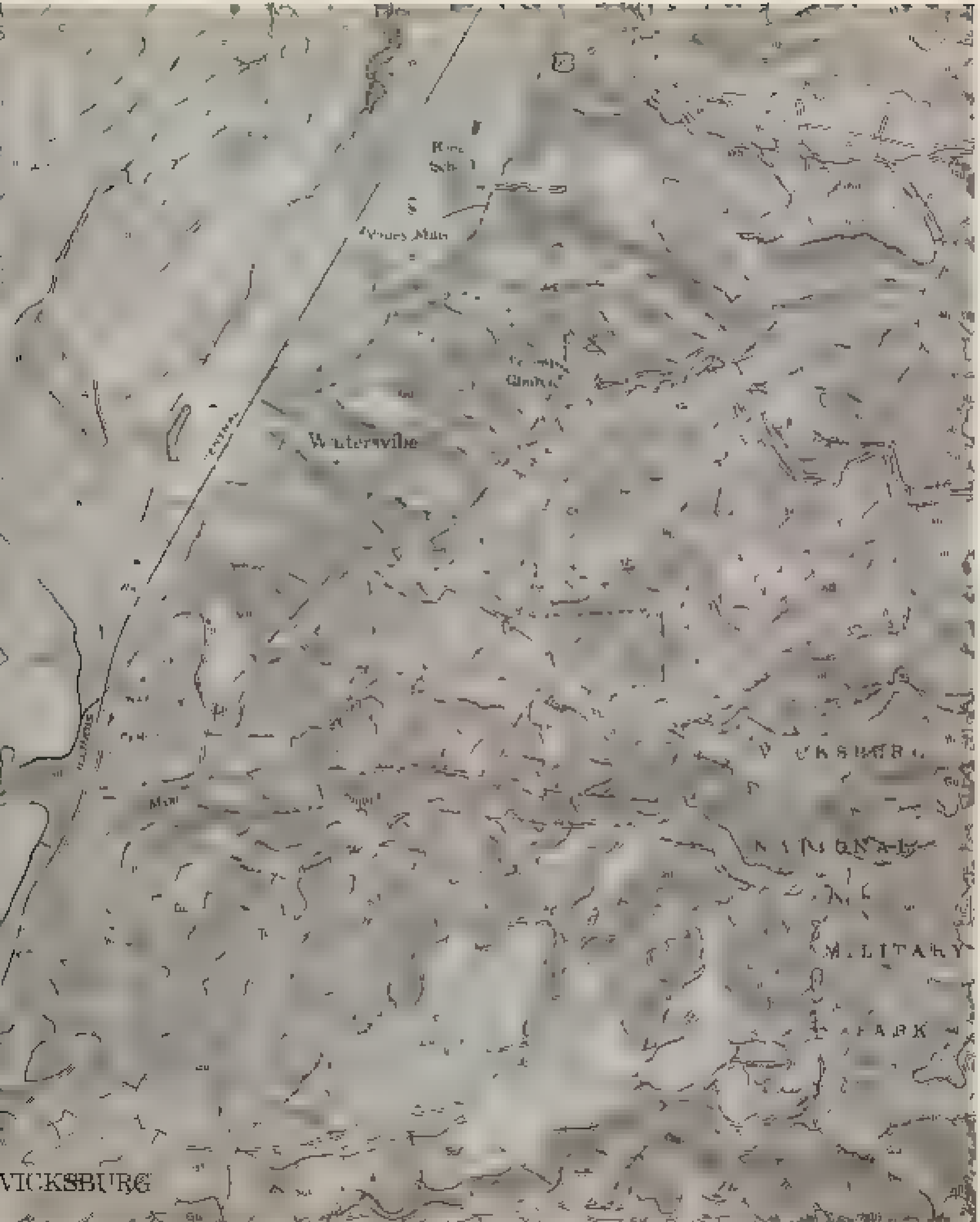


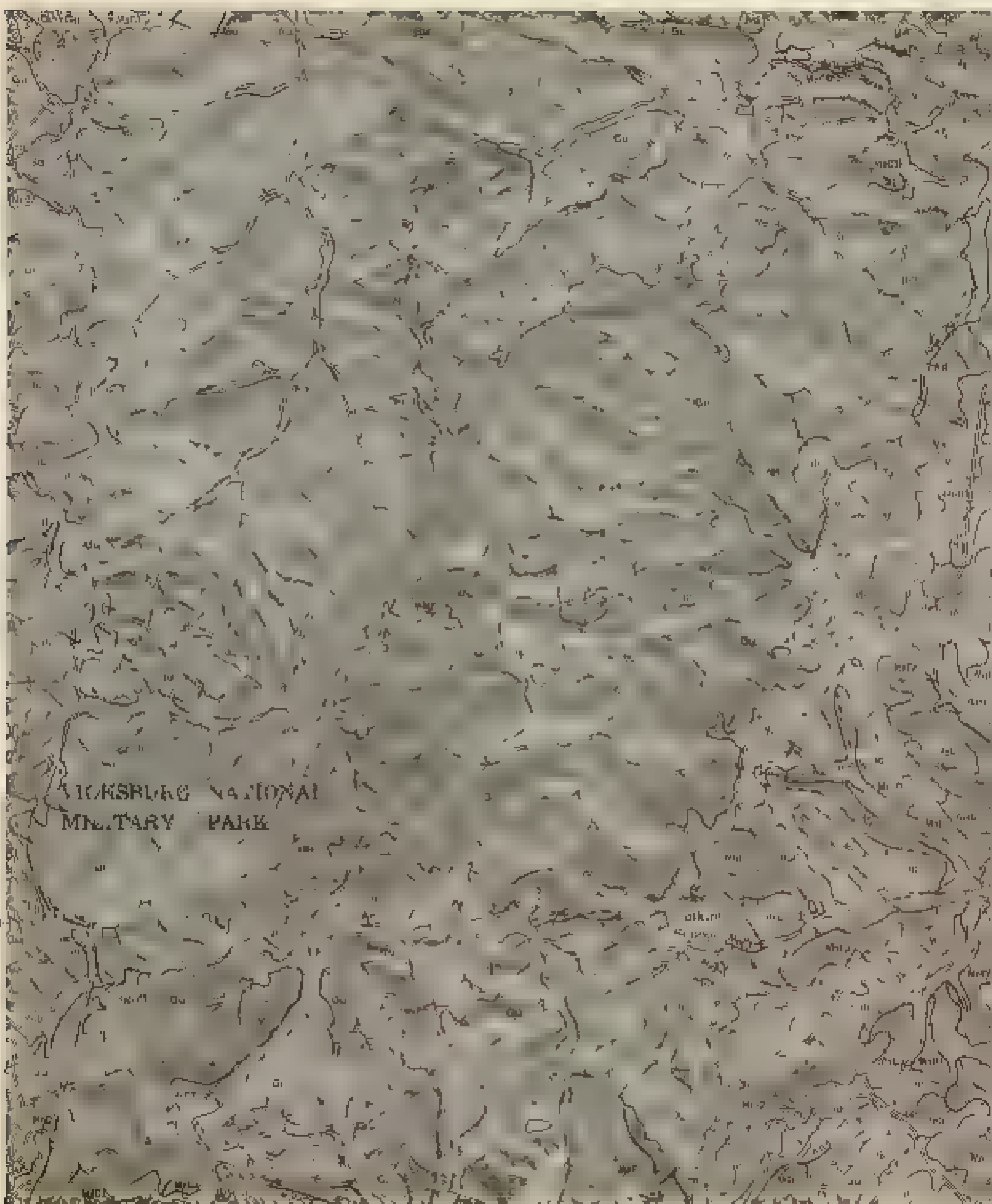
(Joins sheet 36)
43
N
YAZOO
RIVER
DIVERSION
CANAL
DOCK
(Joins sheet 50)

Joins sheet 37

Joins sheet 43

Joins sheet 5?


MILITARY
PARK
VICKSBURG


VICKSBURG NATIONAL
MILITARY PARK
(Joins sheet 46)

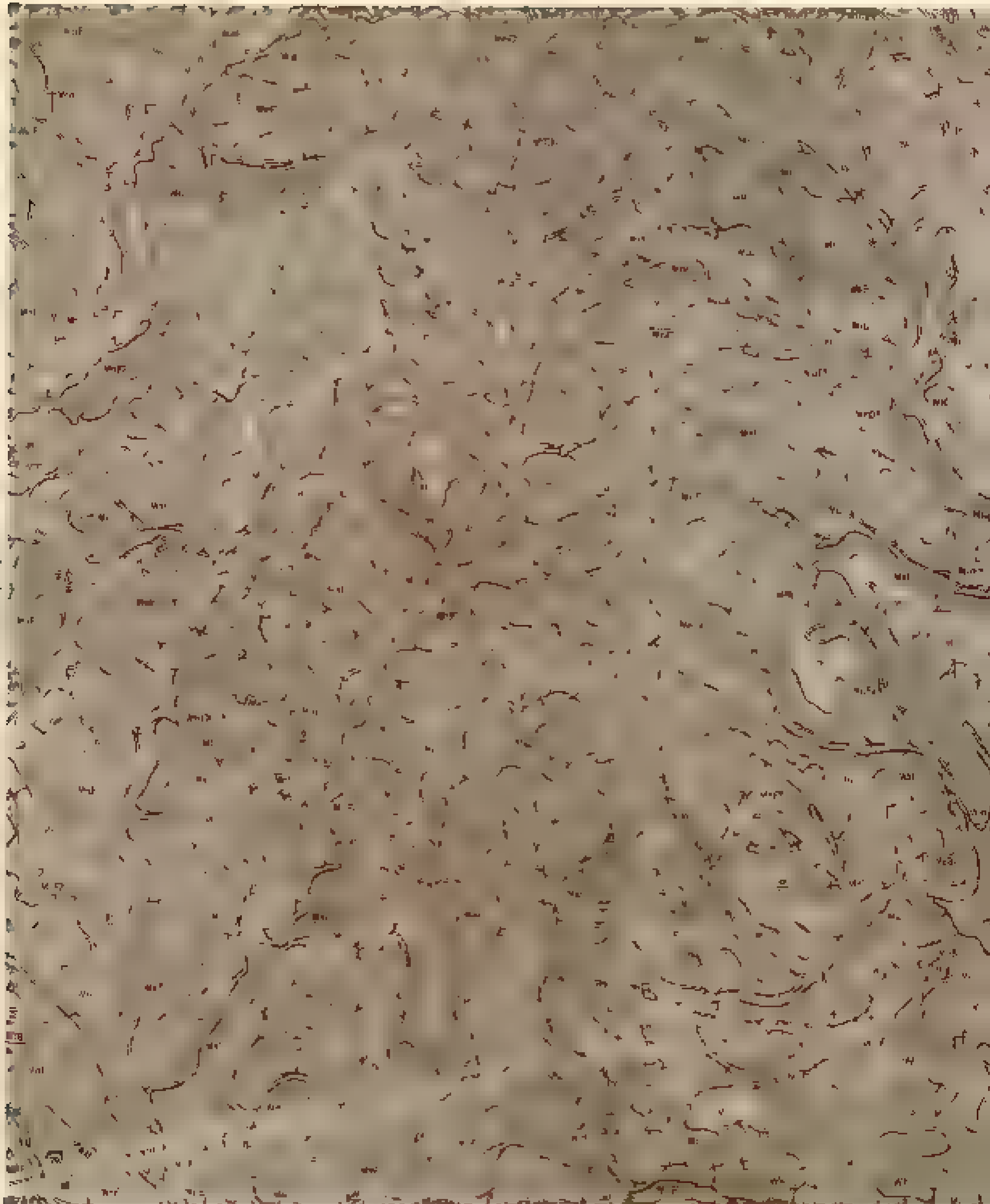

Joins sheet 48
45
N
Joins sheet 46
Joins sheet 57

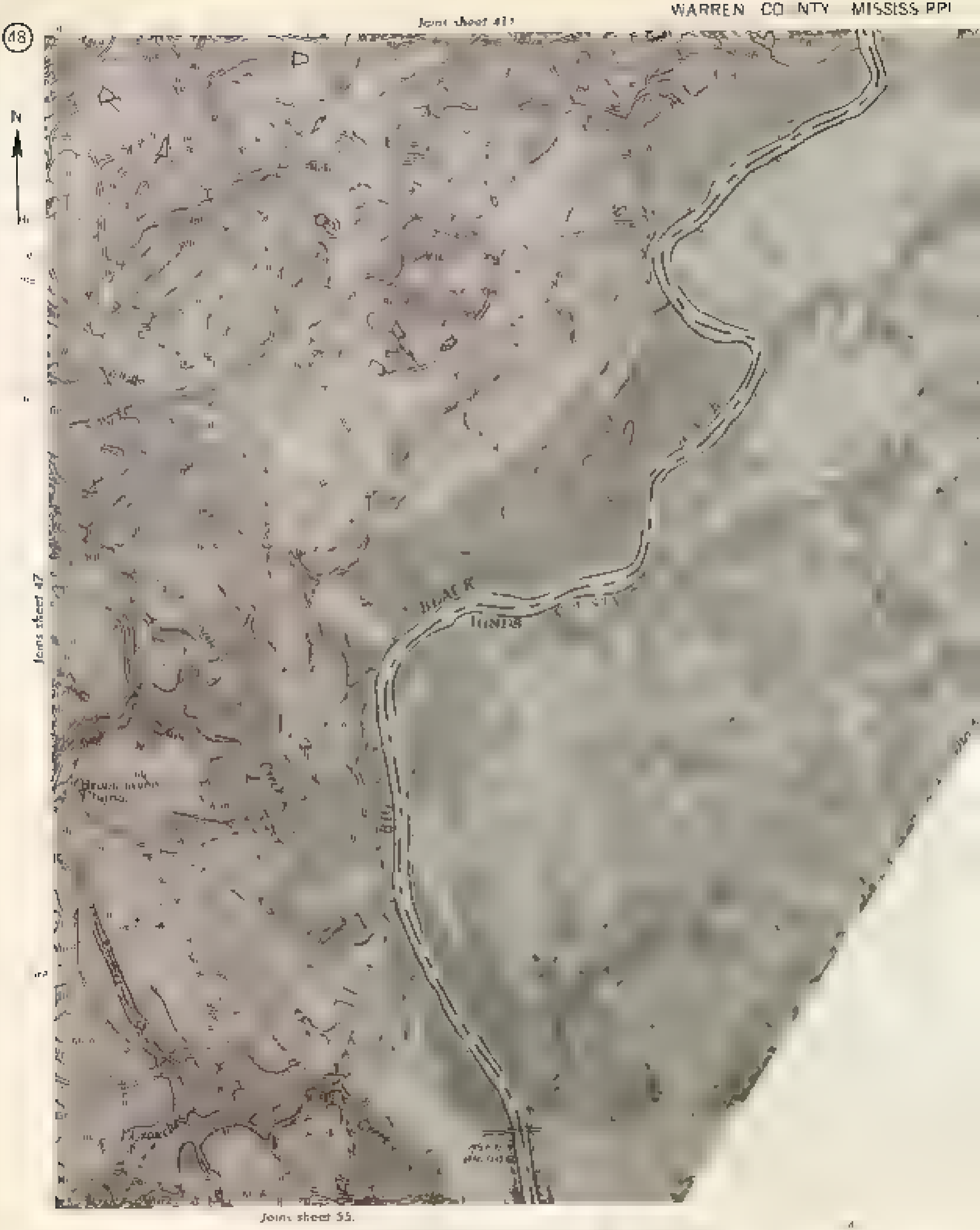
Joins sheet 39

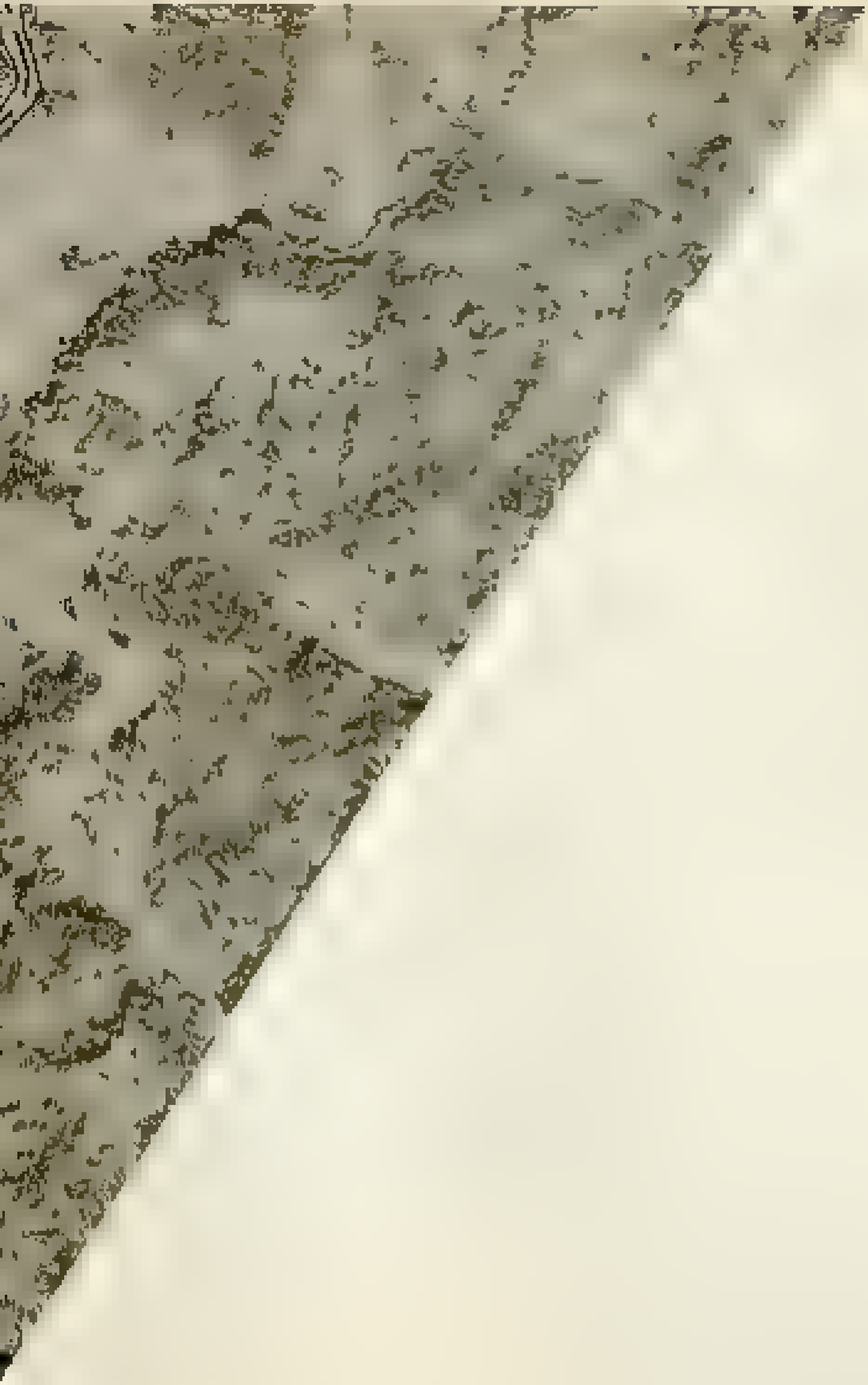
(Joins sheet 45)

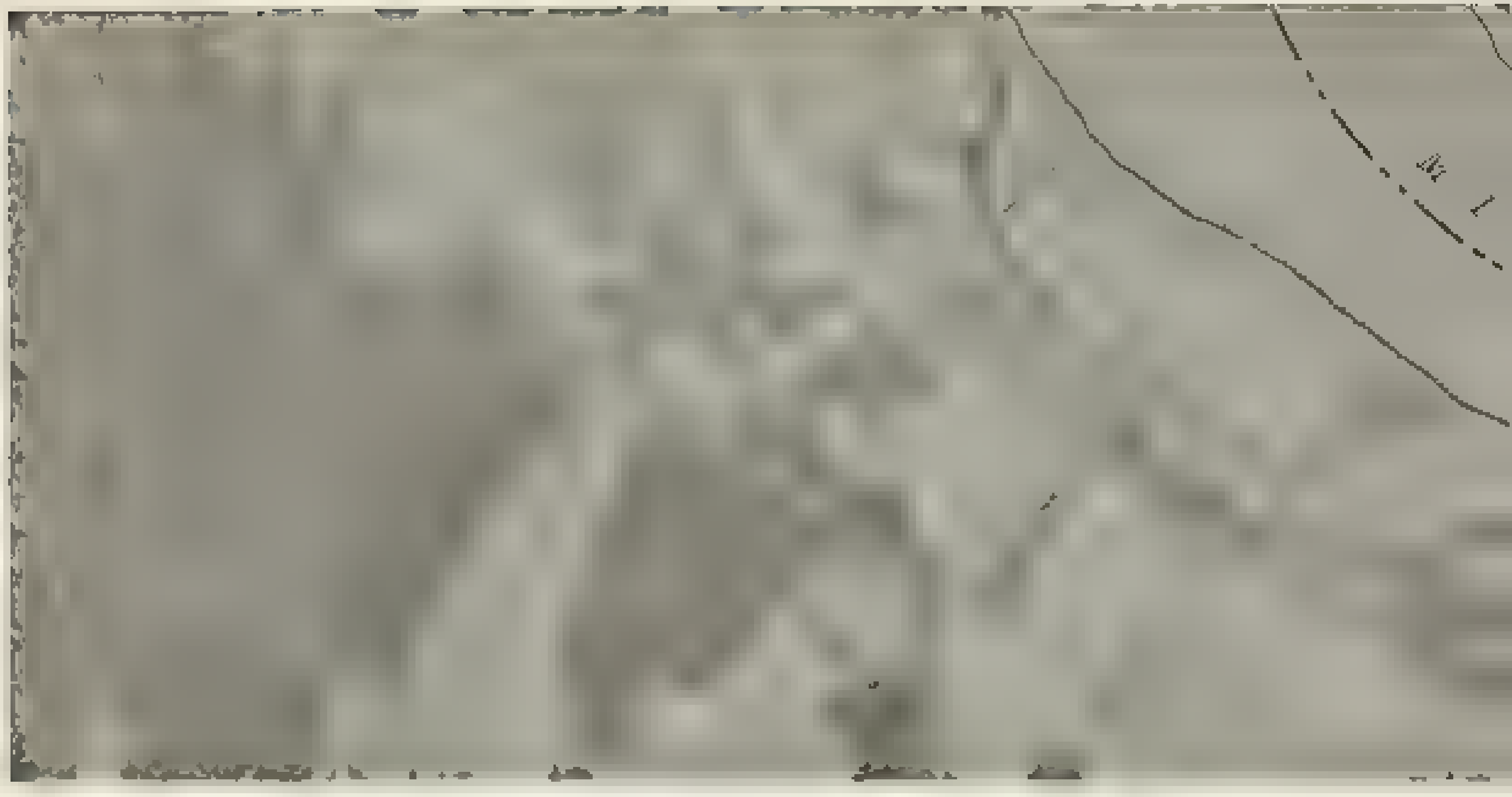
Joins sheet 53

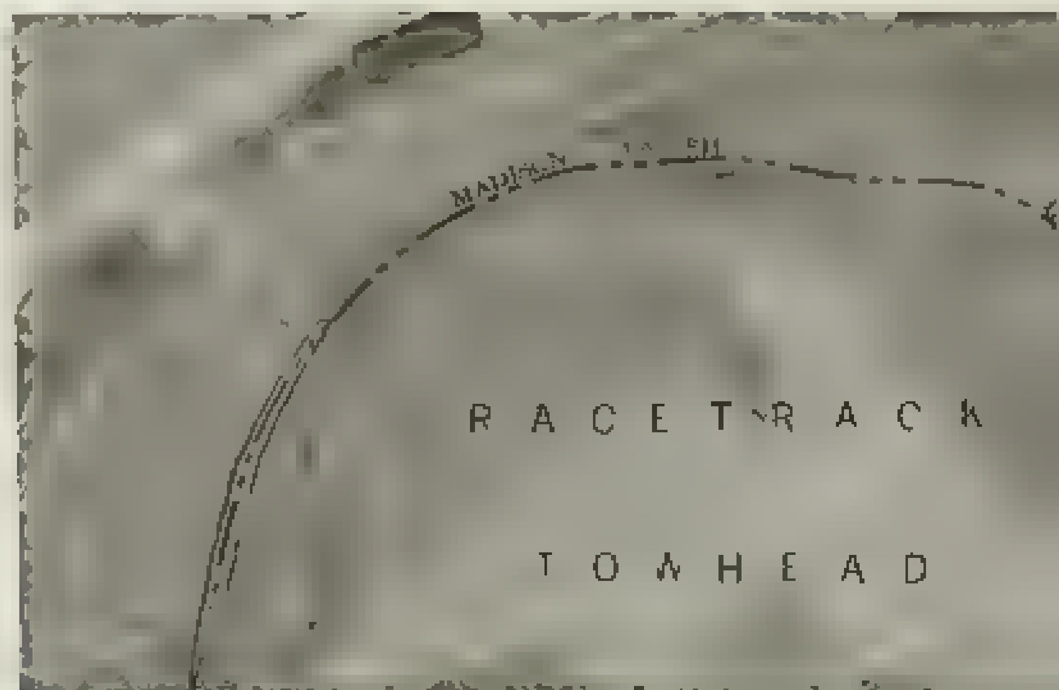
(Joins sheet 47)




N
Joins sheet 47
Joins sheet 55.

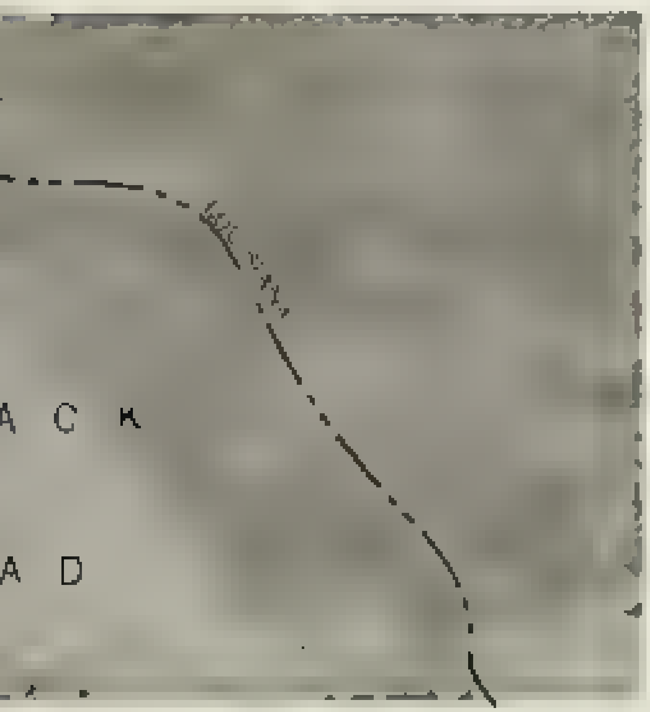






Joins sheet 60.


Joins sheet 42
M I S S I S S I P P I
R I V E R
Joins sheet 50
N


A C K
A D

Joins sheet 43

N

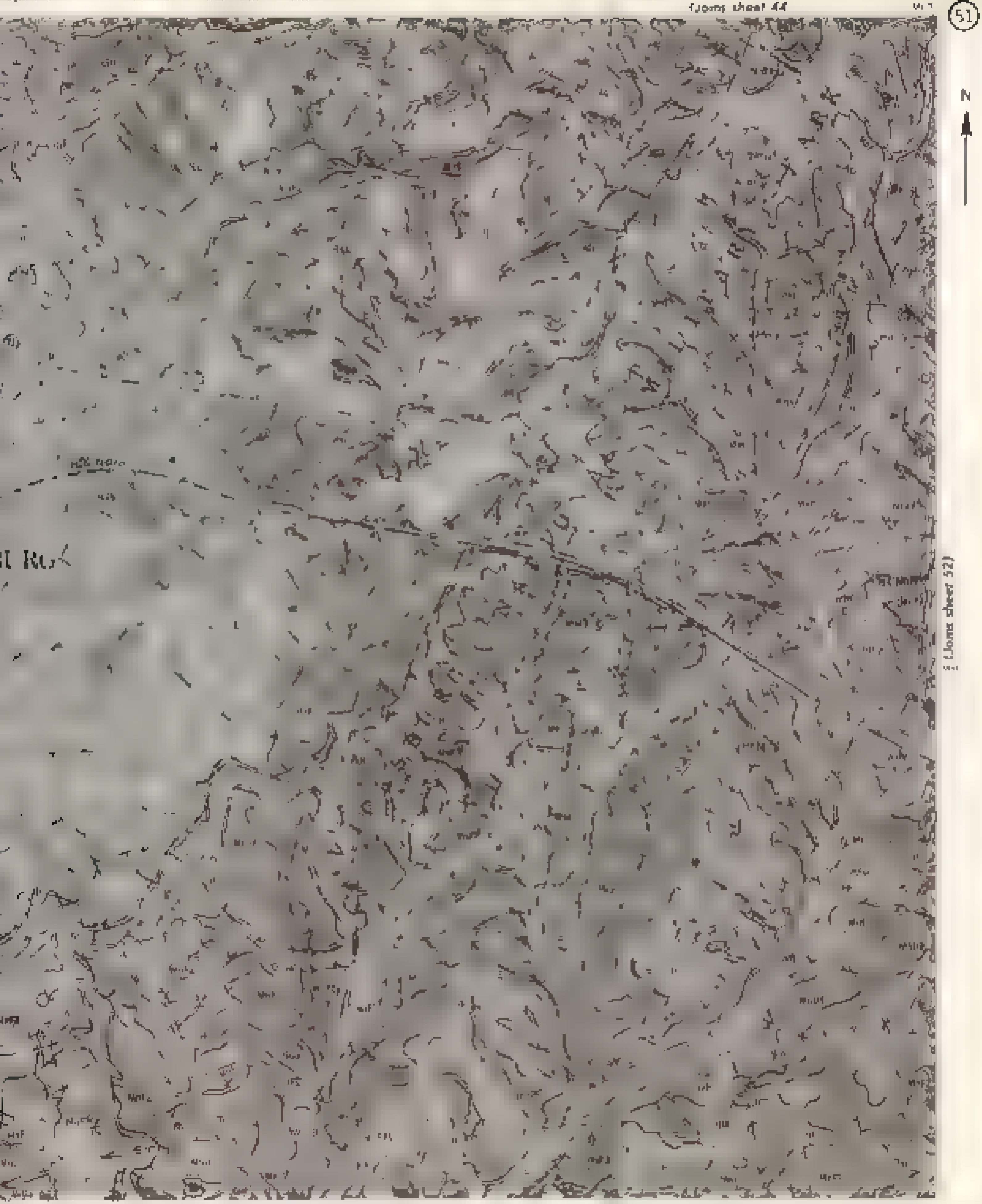
Joins sheet 49

Joins sheet 57

Joins sheet 56

(Joins sheet 50)

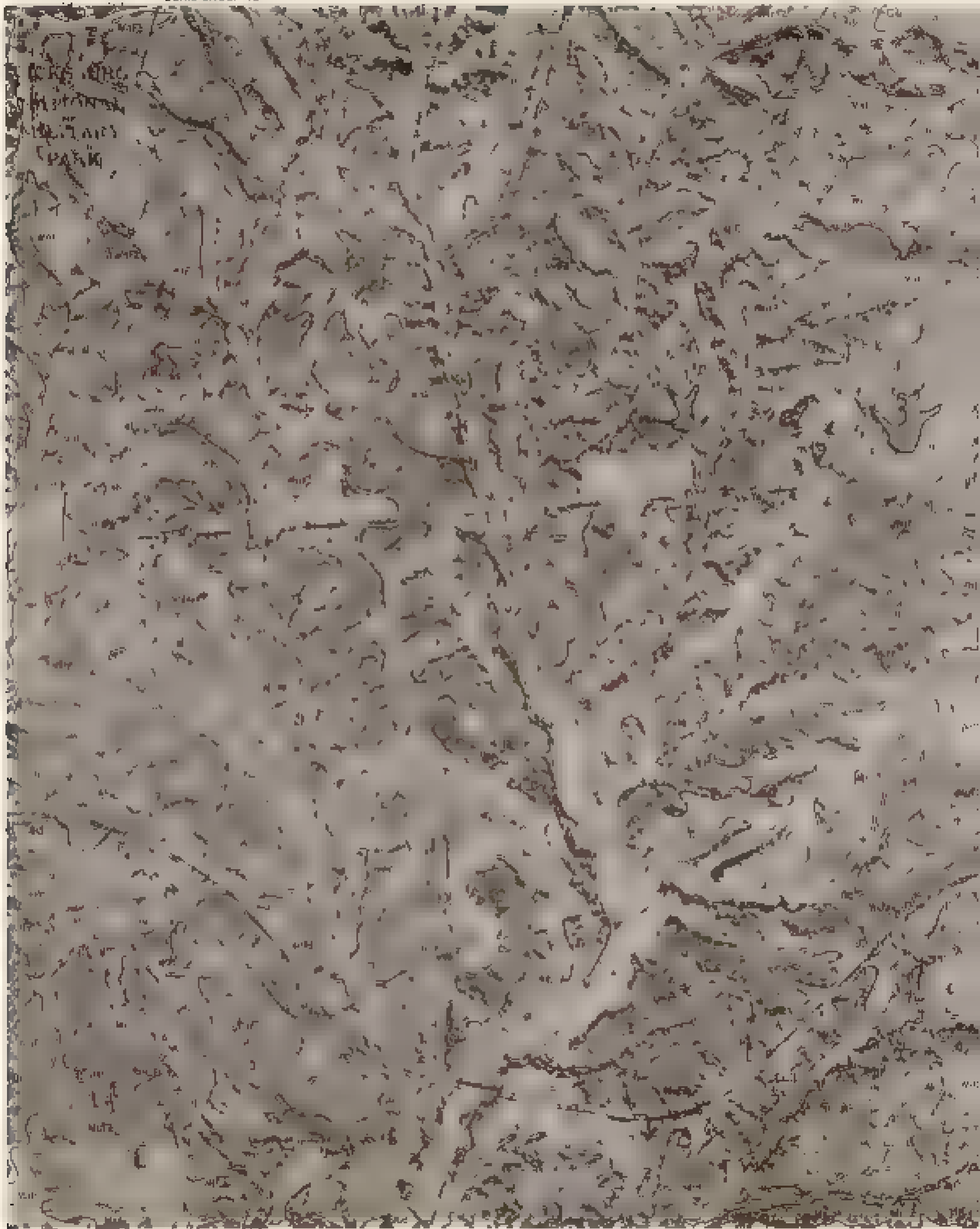
(Joins sheet 56) | (Joins sheet 57)



(Joins sheet 44)
N
(Joins sheet 52)

52

Joins sheet 45



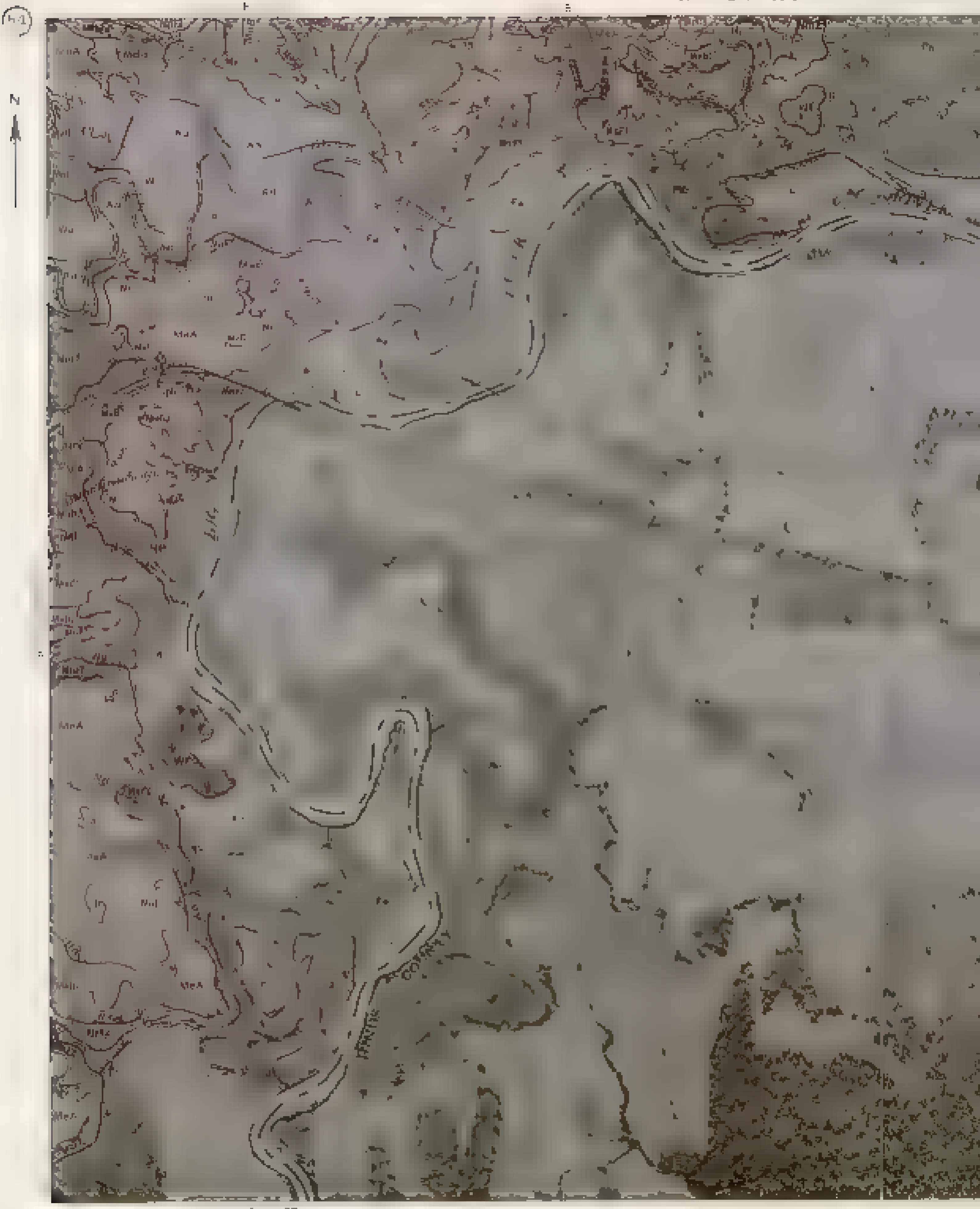
Joins sheet 51

(Joins sheet 57) | (Joins sheet 58)


(Joins sheet 52)
(Joins sheet 58)
(Joins sheet 59)


53
N

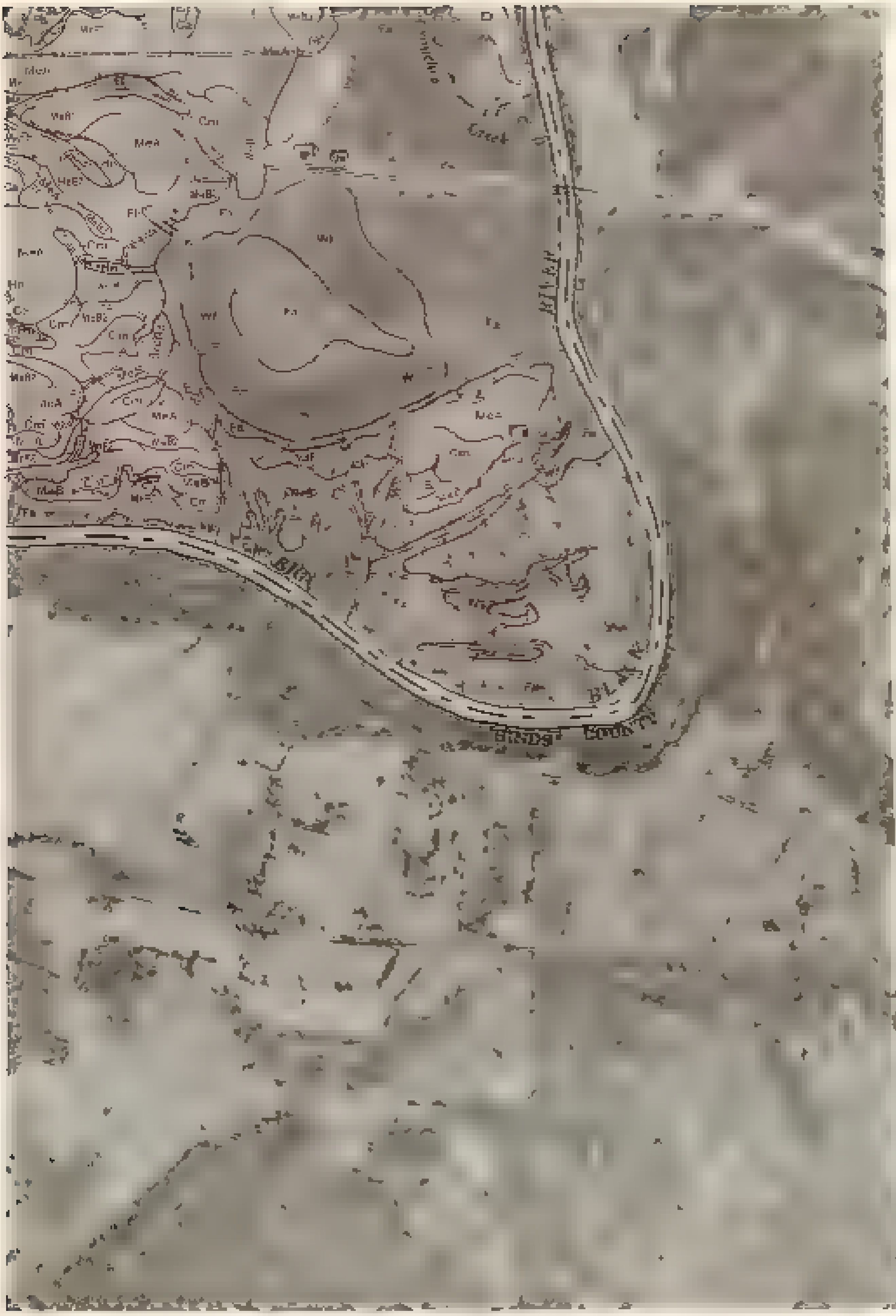
(51)



Joins sheet 59.

Joins sheet 48

Joins sheet 54



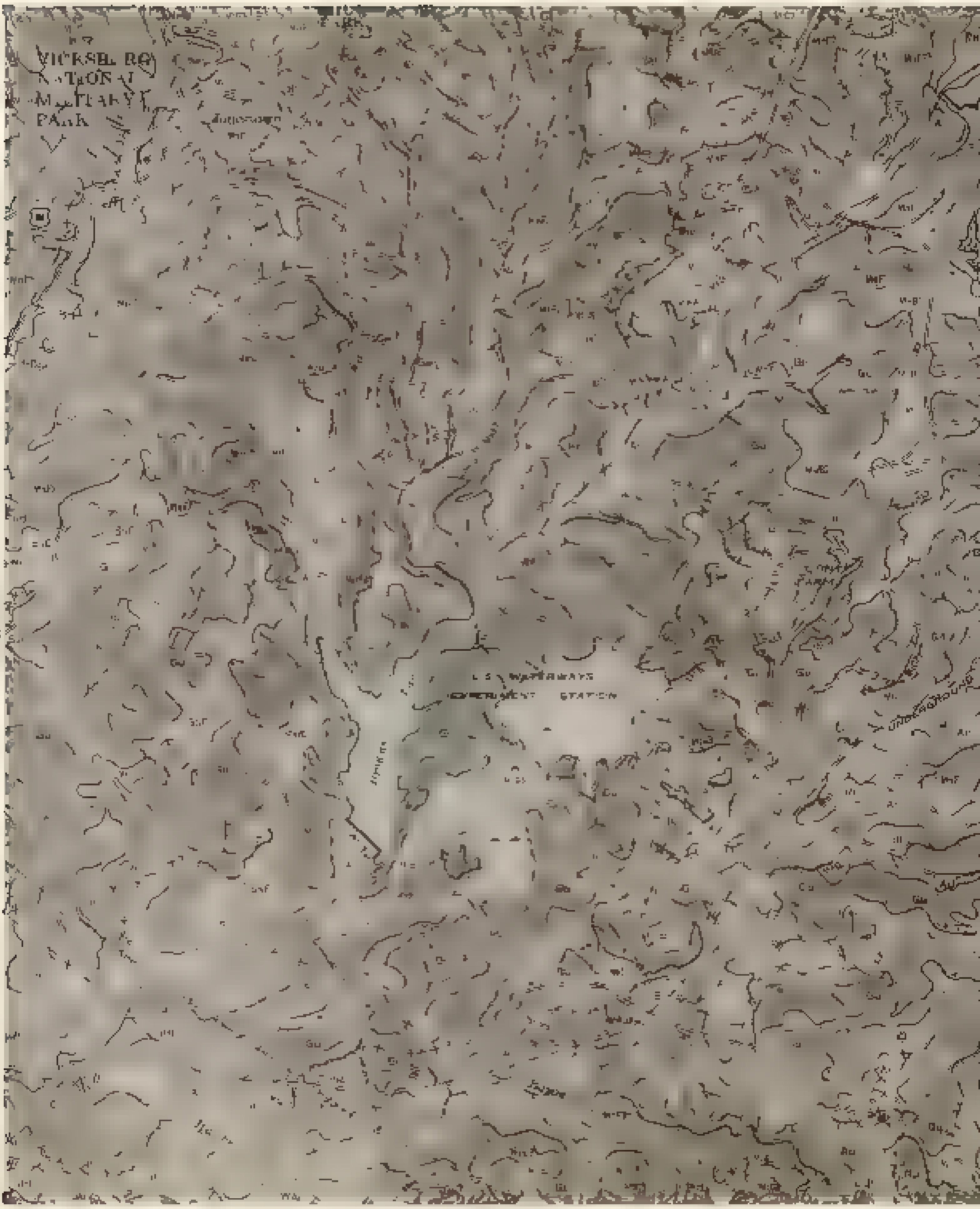
1 55

N

0

Joins sheet 61

SHEET NUMBER 56 (Joins sheet 50) | (Joins sheet 57)


VICKSBURG
NATIONAL
MILITARY
PARK
U S WATERWAYS
EXPERIMENT STATION

(Joins sheet 51) | (Joins sheet 52)

N

Joins sheet 58

Joins sheet [illegible]

Joins sheet 57

Joins sheet 63

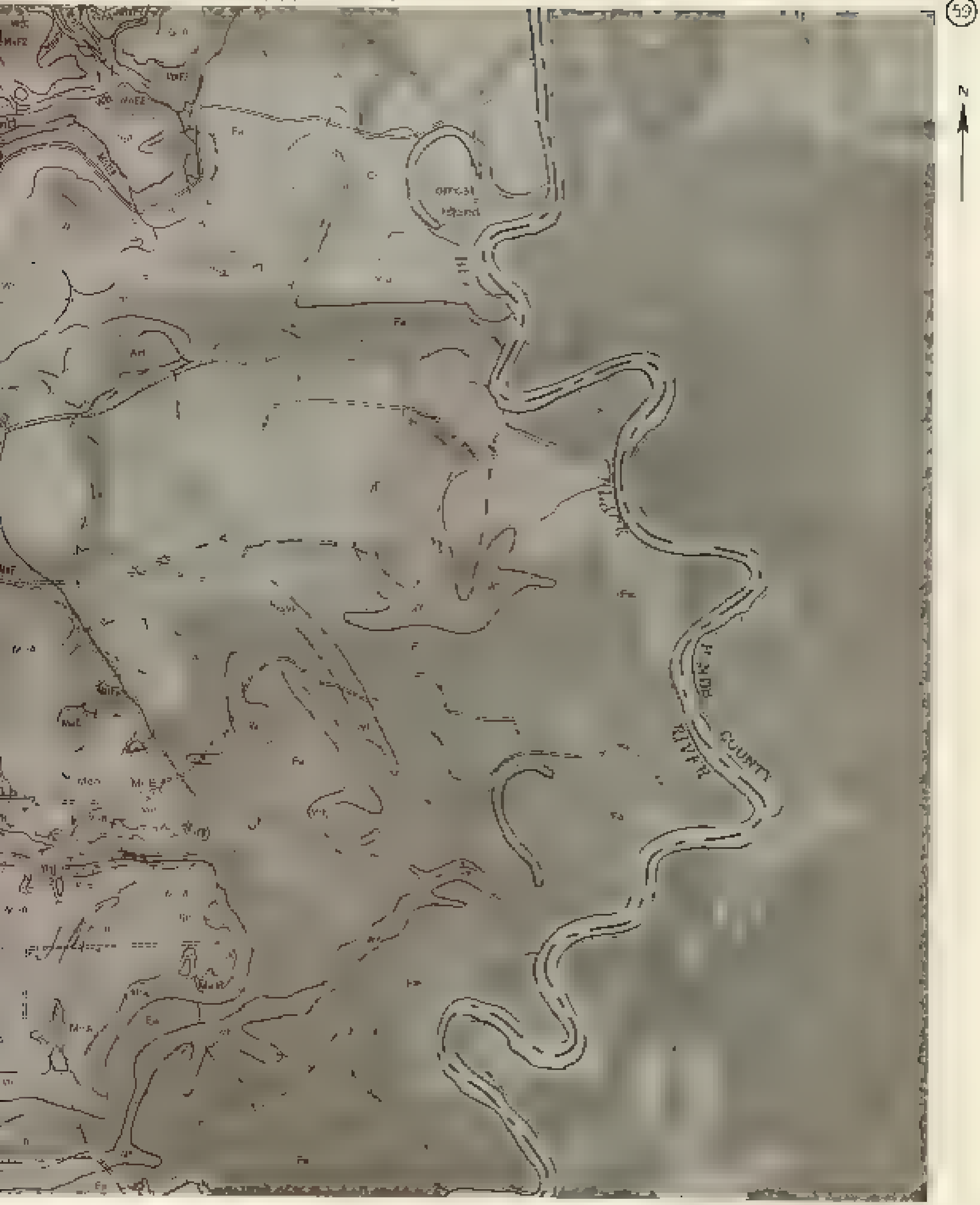
SHEET NUMBER 58

Joins sheet 52 Joins sheet 51

(Joins sheet 58)

Joins sheet 64

HEET N MBER 59 (Joins sheet 53) | (Joins sheet 54)

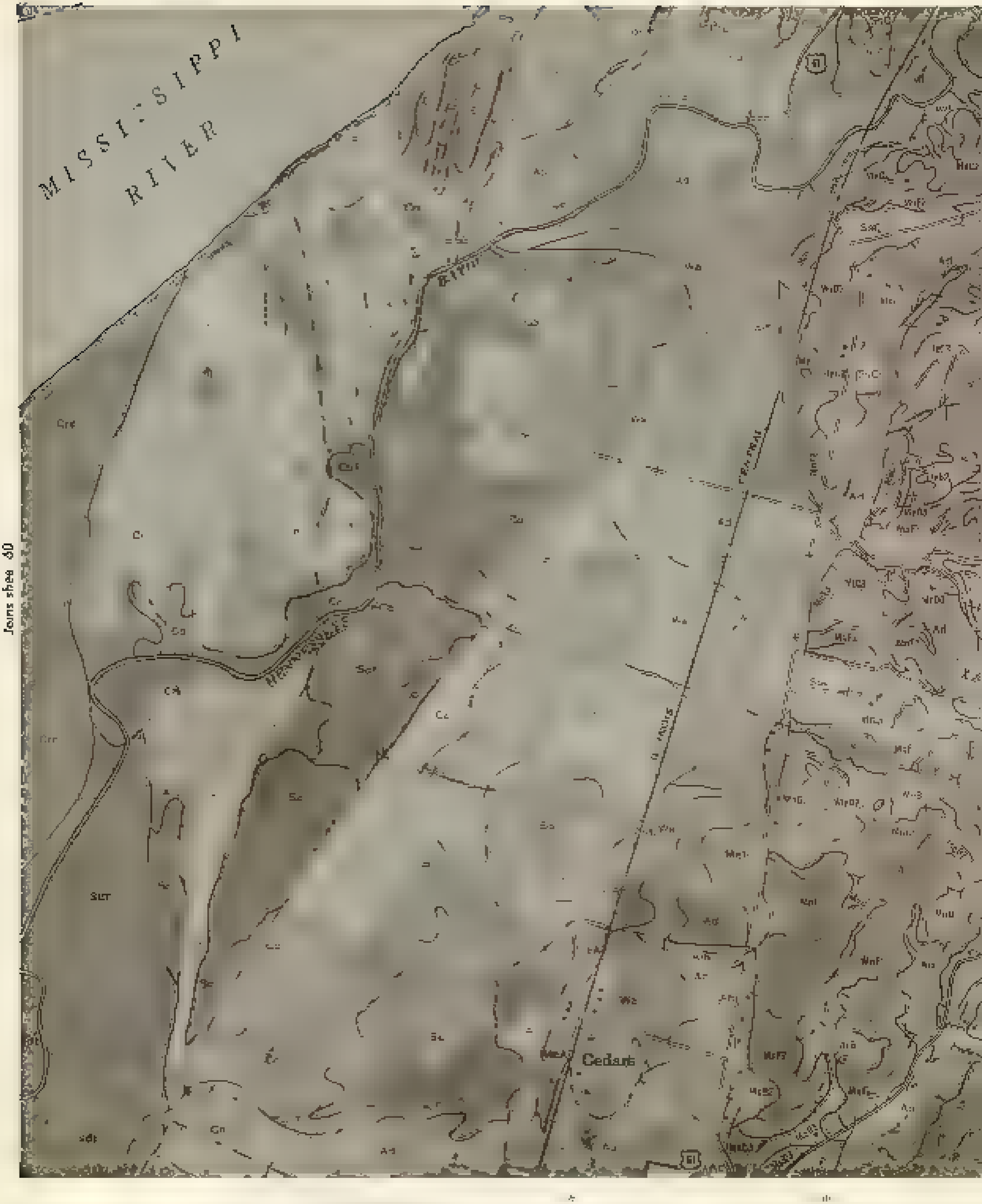


(60)

(Joins inset, sheet 49)

Joins sheet 6

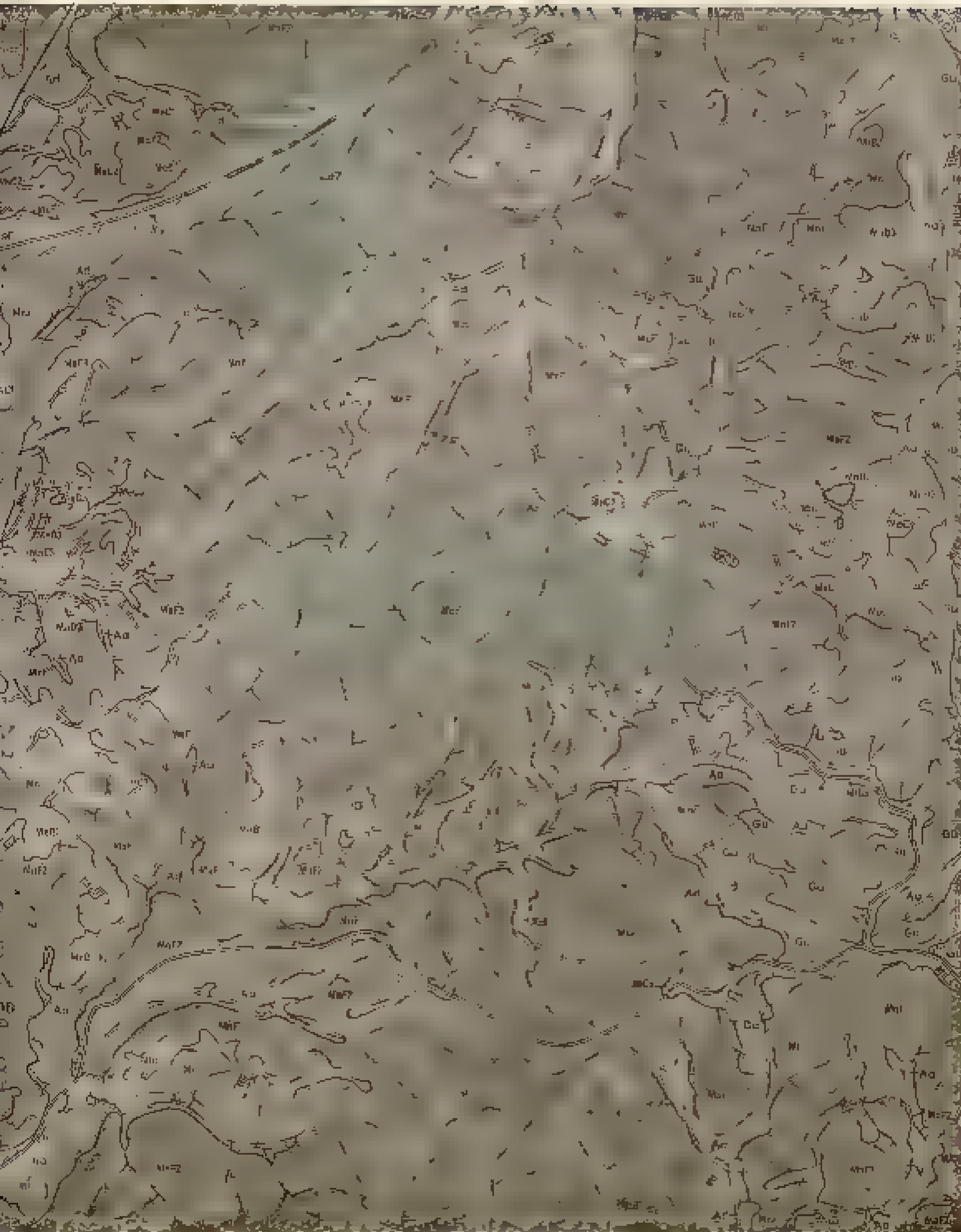
(Joins sheet 65)


MISSISSIPPI
RIVER
Cedars
Joins sheet 40

Joins sheet 56

(61)

N



Joins sheet 62

Joins sheet 66

(Joins sheet 57)

(Joins sheet 67)

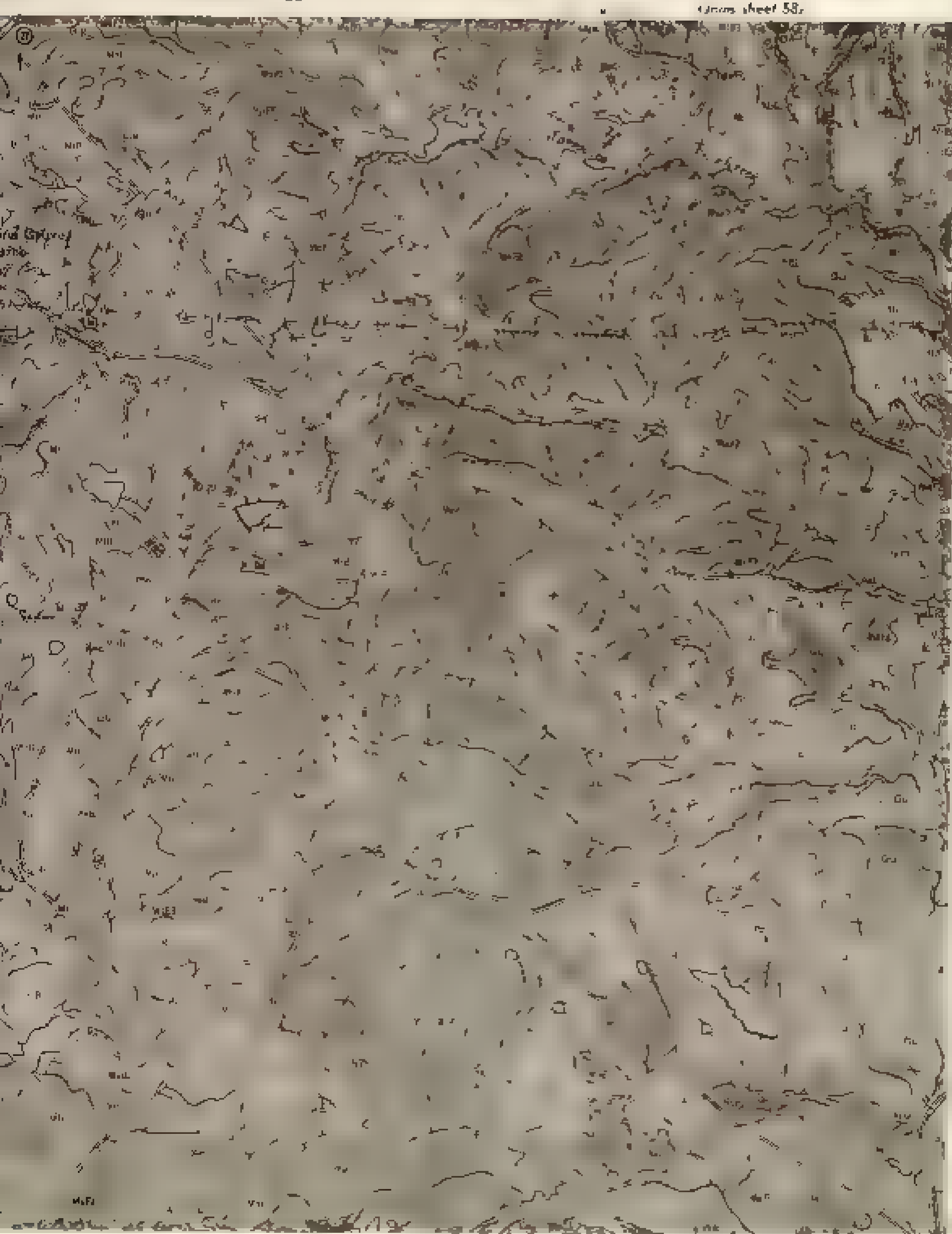
Join sheet 63


Church
Church
Joins sheet 62

Joins sheet 58

63

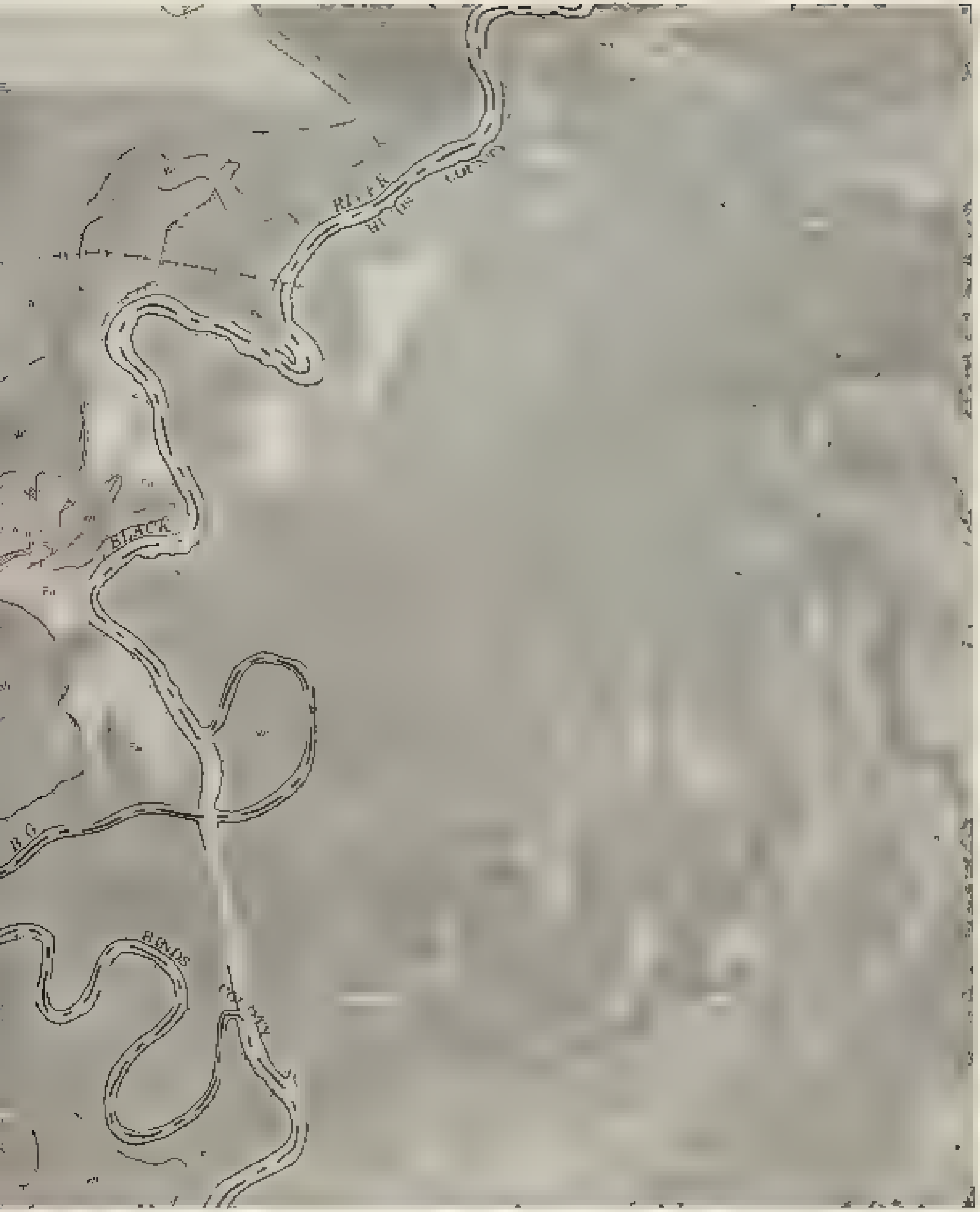
N

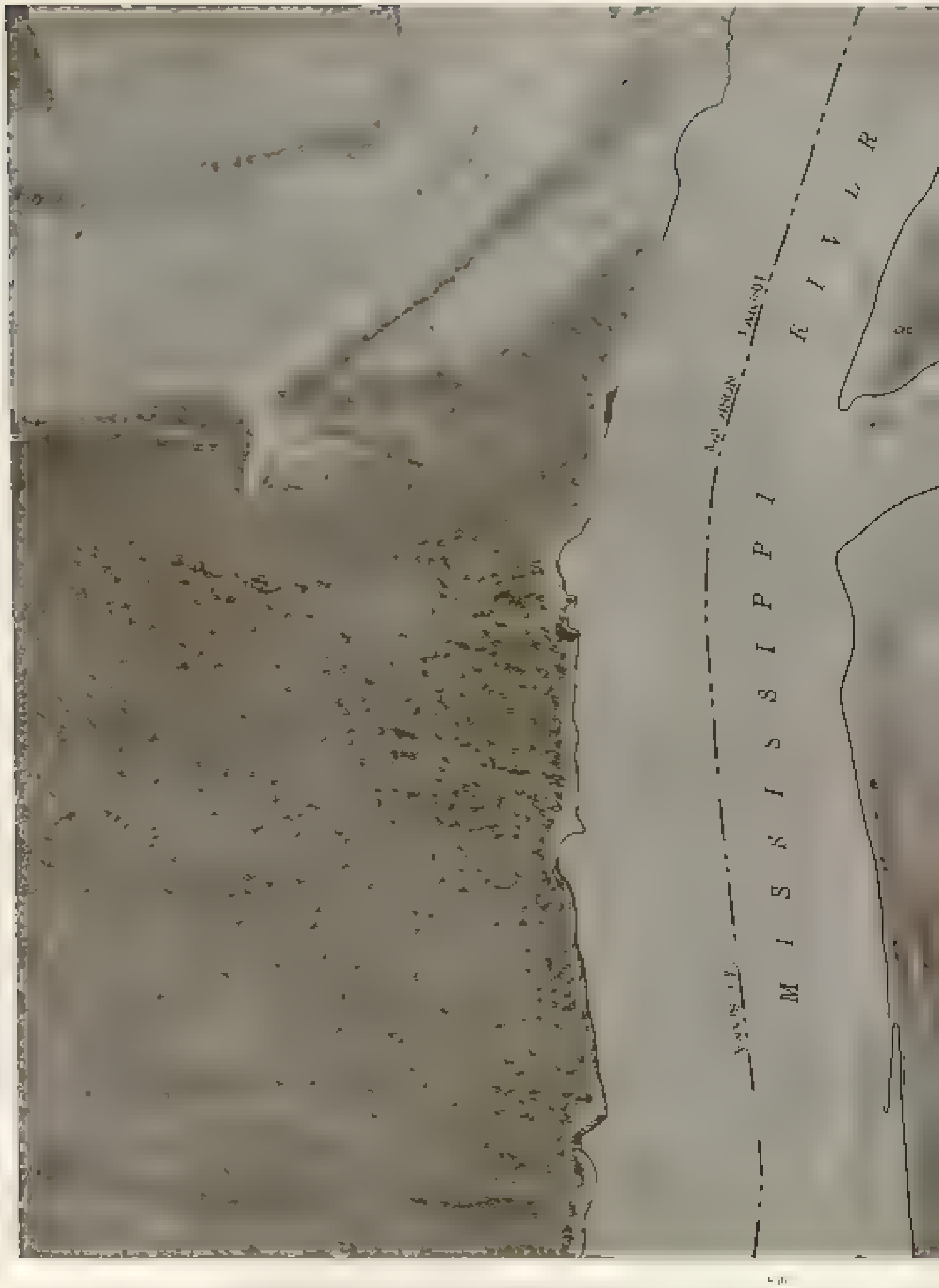


Joins sheet 64

Joins sheet 68


64
(Joins sheet 59)
N
Joins sheet 63
Joins sheet 69


BLACK



(Joins sheet 72)

(Joins sheet 60.)

65

(Joins sheet 66)

(Joins sheet 73)

65

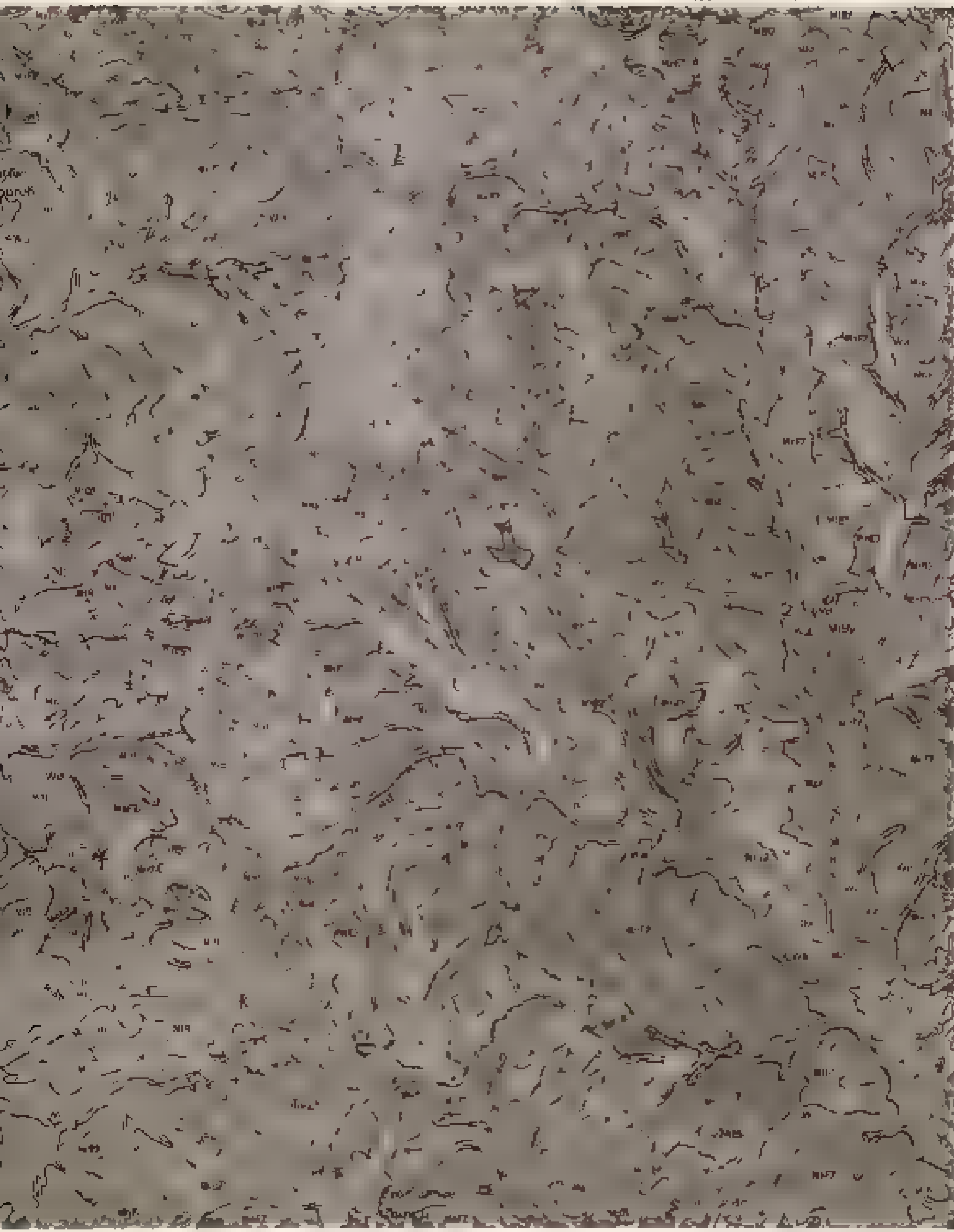
(Joins sheet 61)

Joins sheet 74

Joins sheet 67

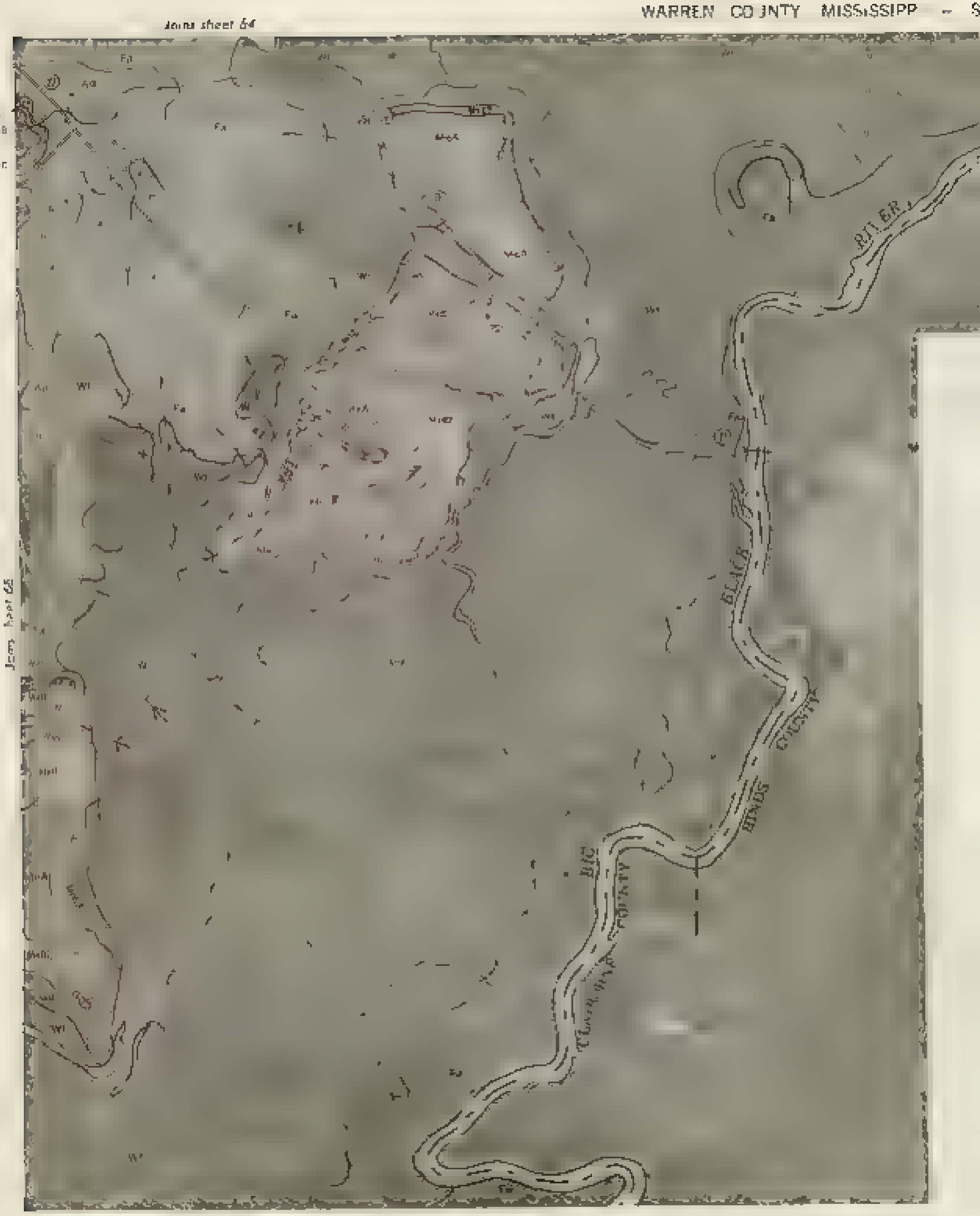

Joins sheet 56

(Joins sheet 62)



(Joins sheet 68)

(Joins sheet 75)


Joins sheet 64
BLACK
RIVER
HINDS
COUNTY
BIG
COUNTY

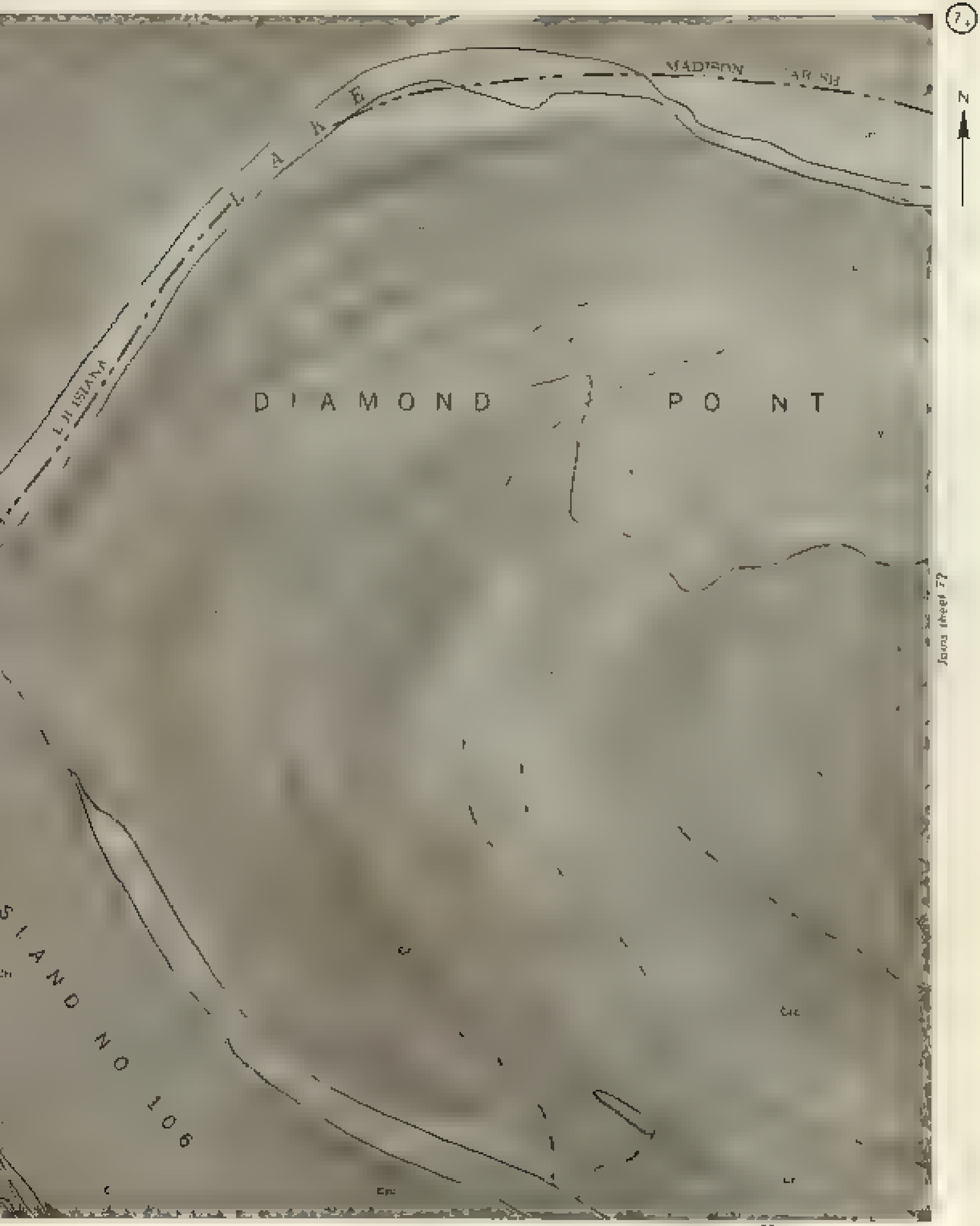

BLACK

N

Joins sheet 71

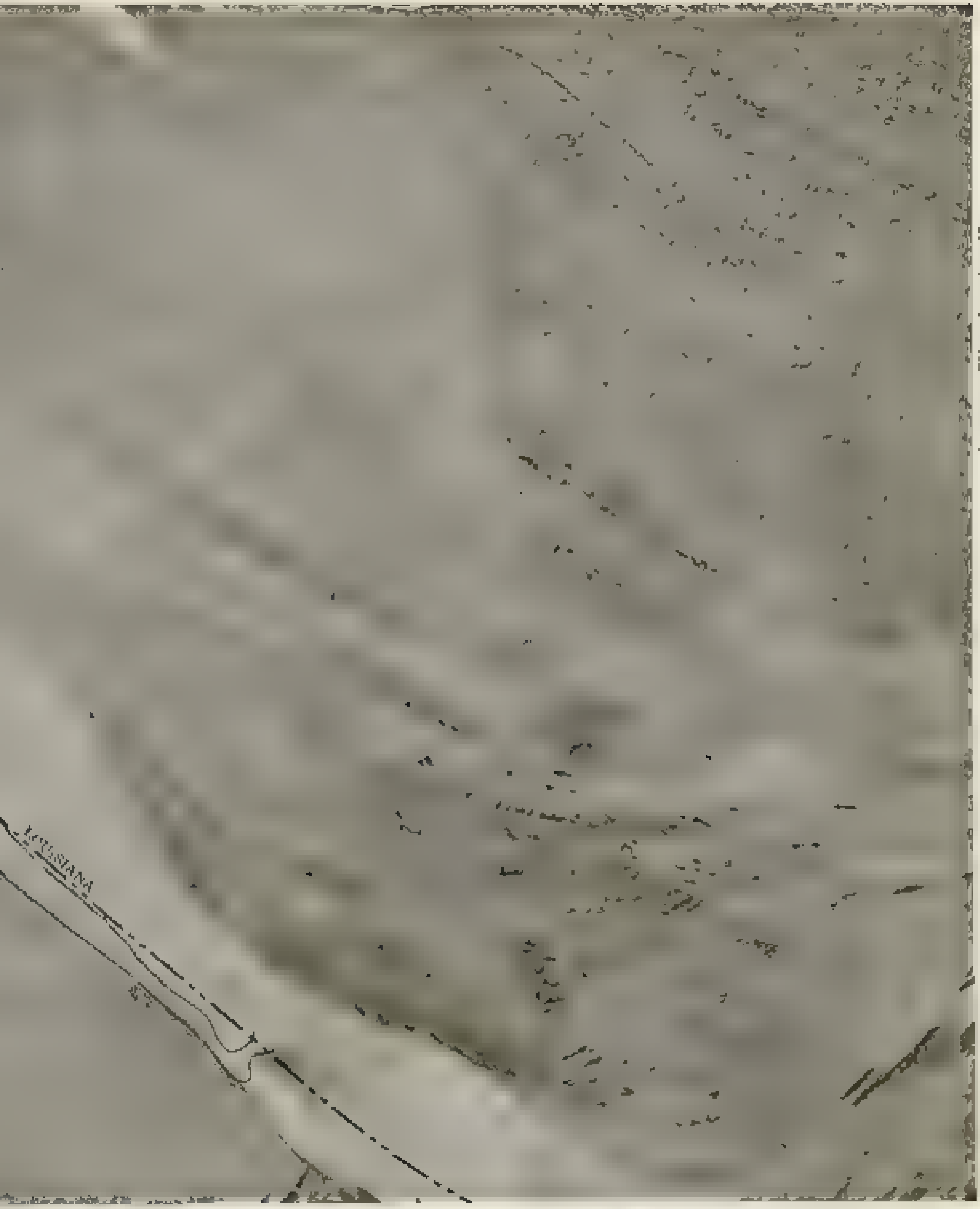
Joins sheet 77


MADISON
PARISH
LOUISIANA
P A L M Y R A
PALMYRA ISLAND

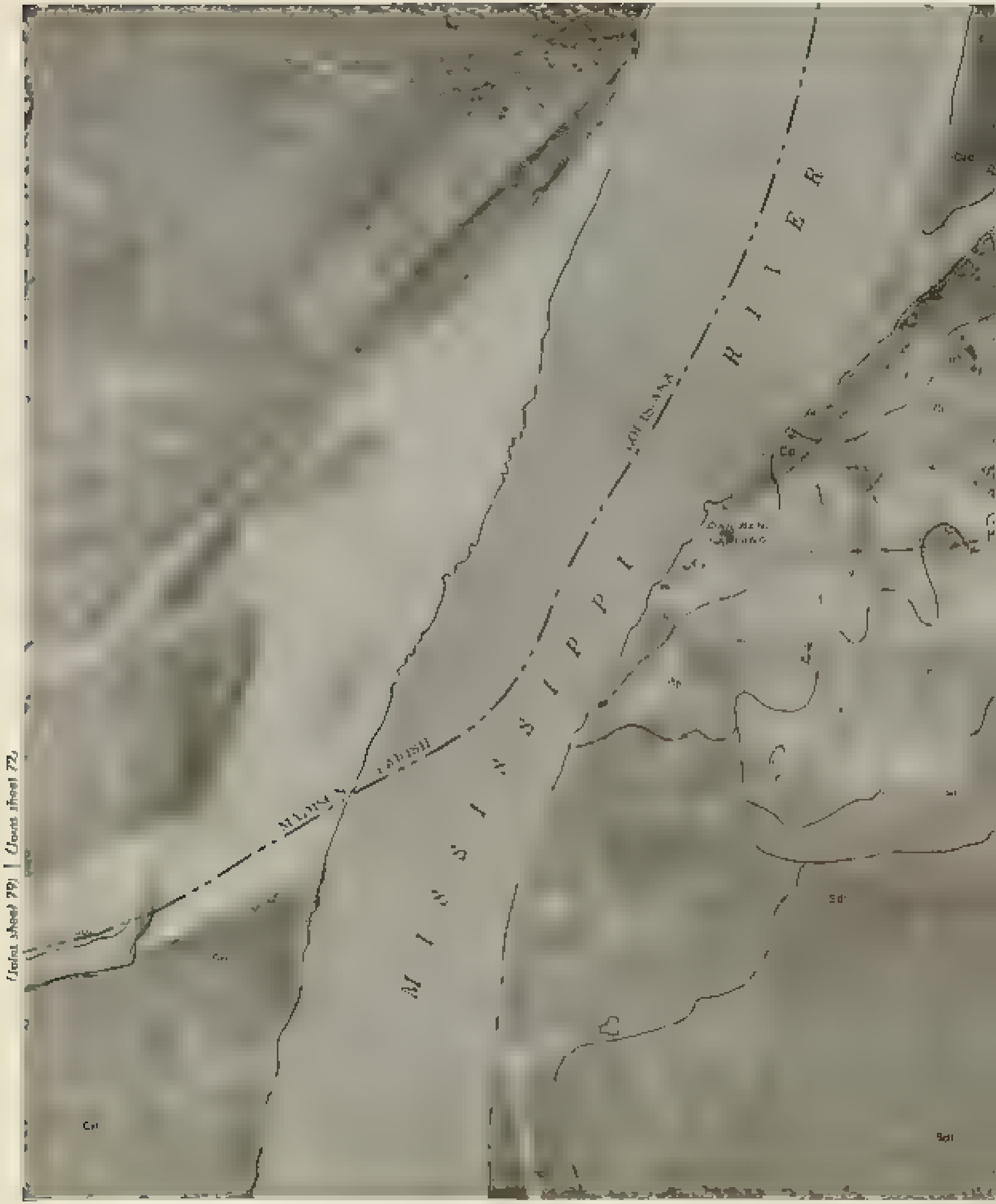


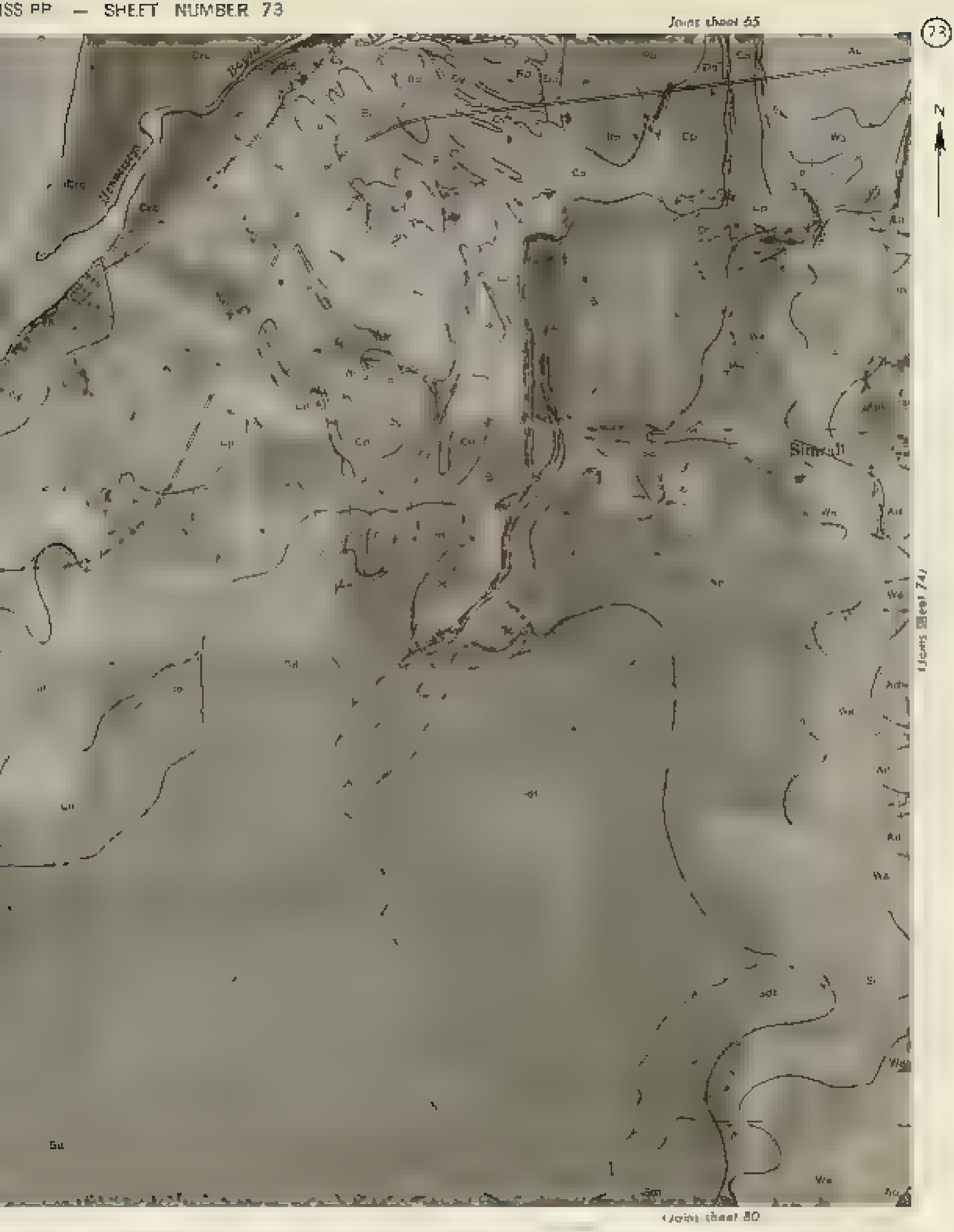
(Joins sheet 78.


N
DIAMOND
POINT
Joins sheet 71
Joins sheet 79



(Joins sheet 73) Joins sheet 65.


MISSISSIPPI RIVER
LOUISIANA


73
Joint sheet 65
N
(Joint sheet 74)
Joint sheet 80

(Joins sheet 66)


(Joins sheet 75)


(Joins sheet 72)

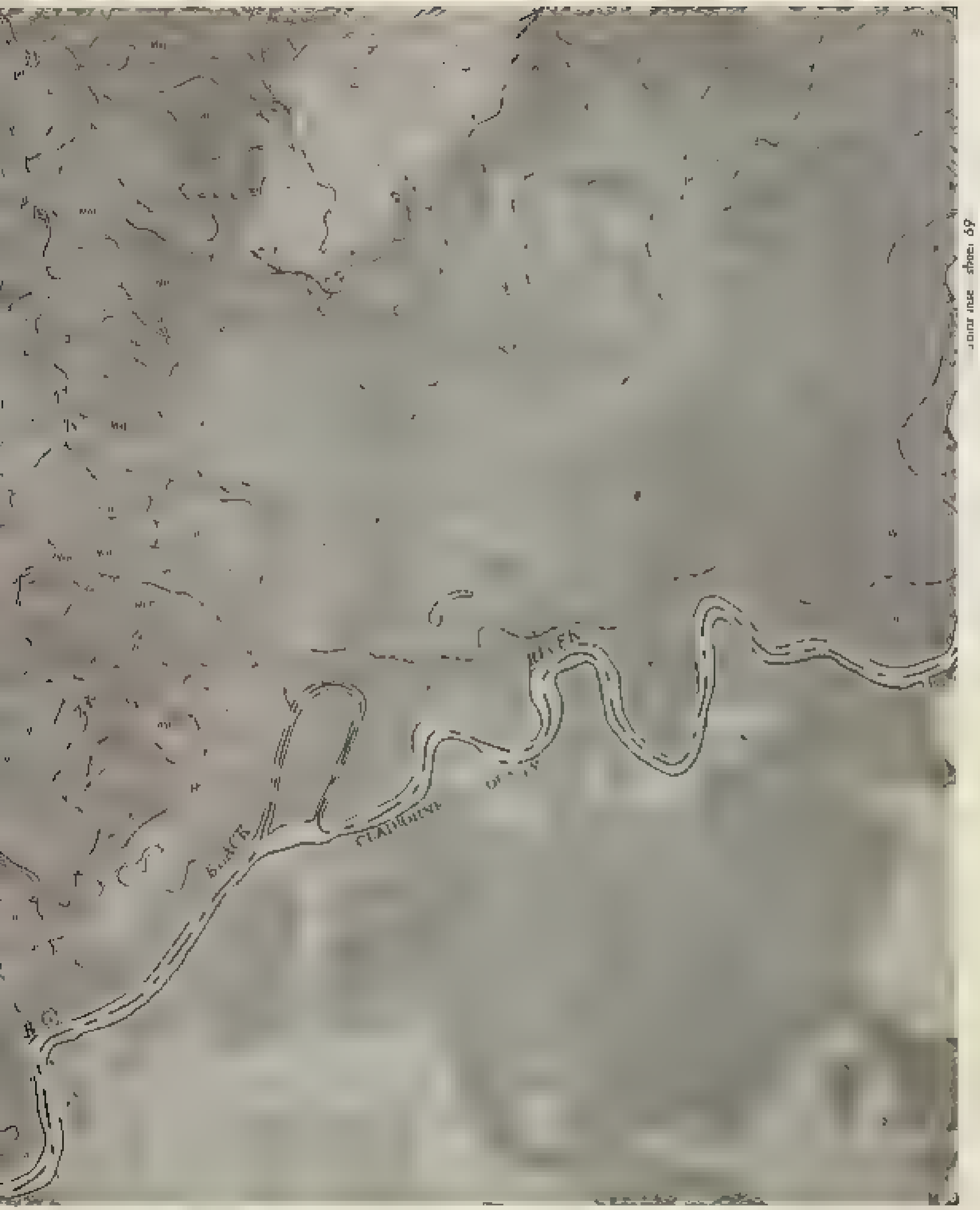
Joins sheet 67

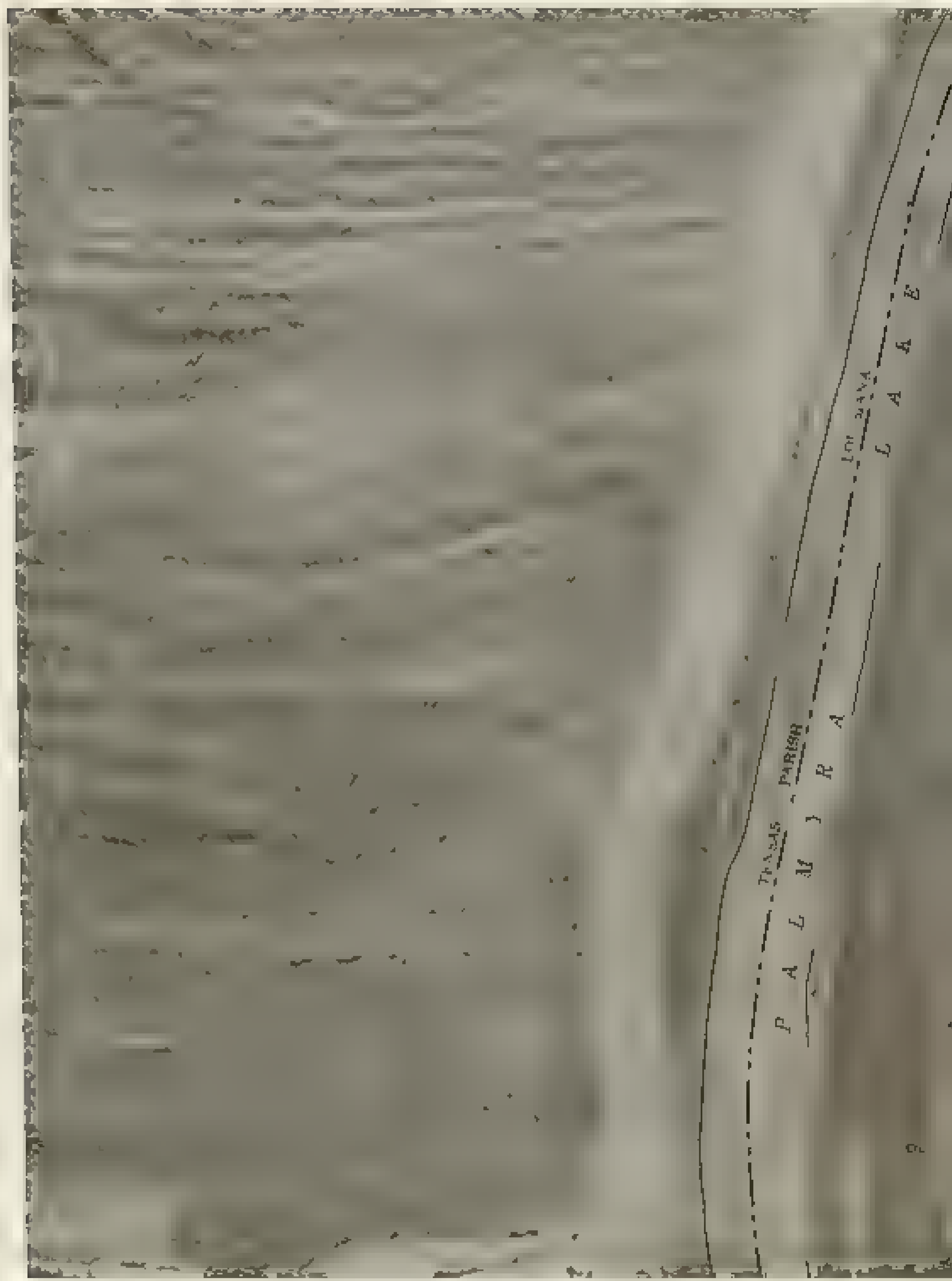
(75)

Joins sheet 76

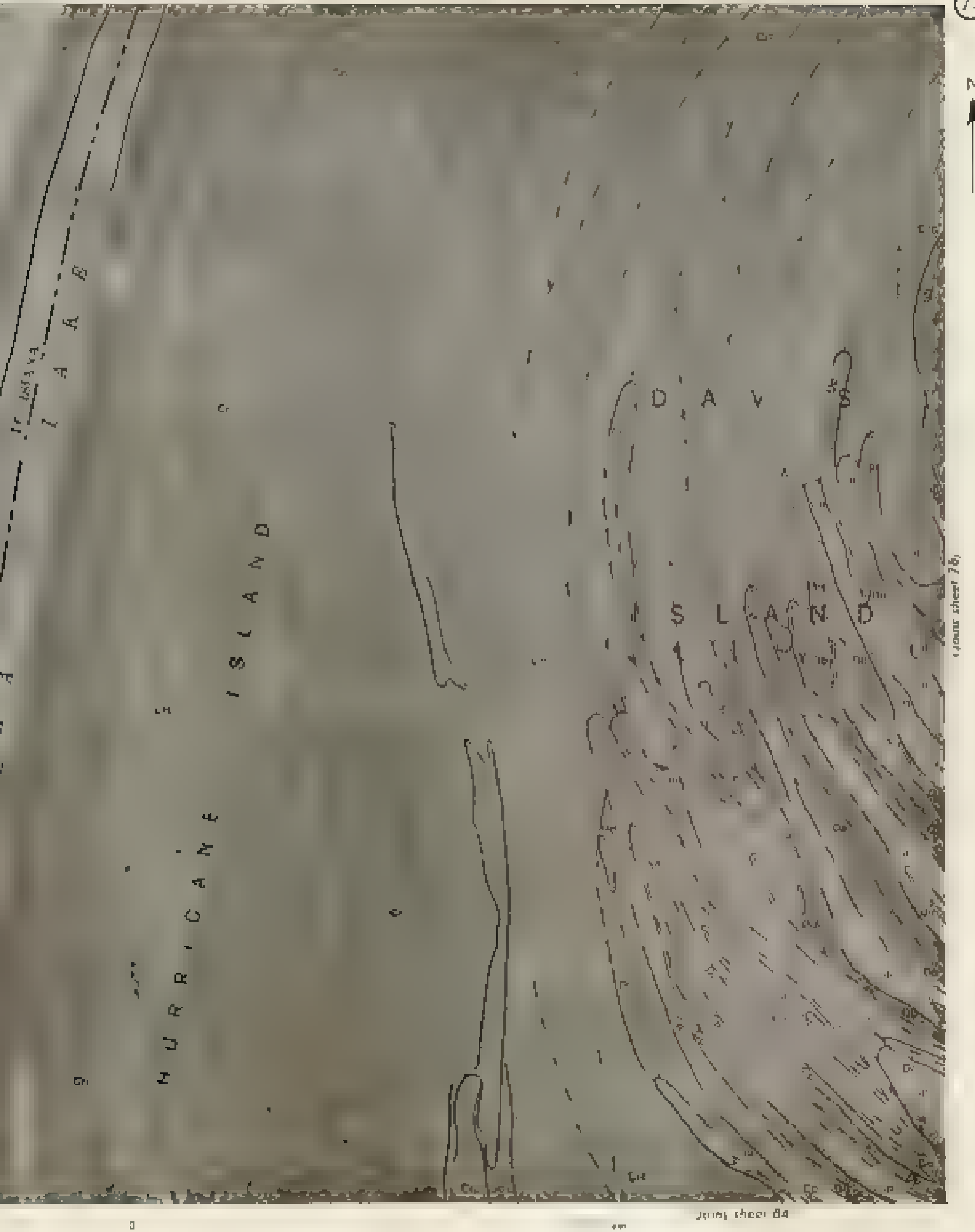
(Joins sheet 82.


76
N
Joins sheet 68
Joins sheet 75
Joins sheet 83
Mil


RIVER
sheet 69


PALMYRA LAKE
TENSAS PARISH

(Joins sheet 70)

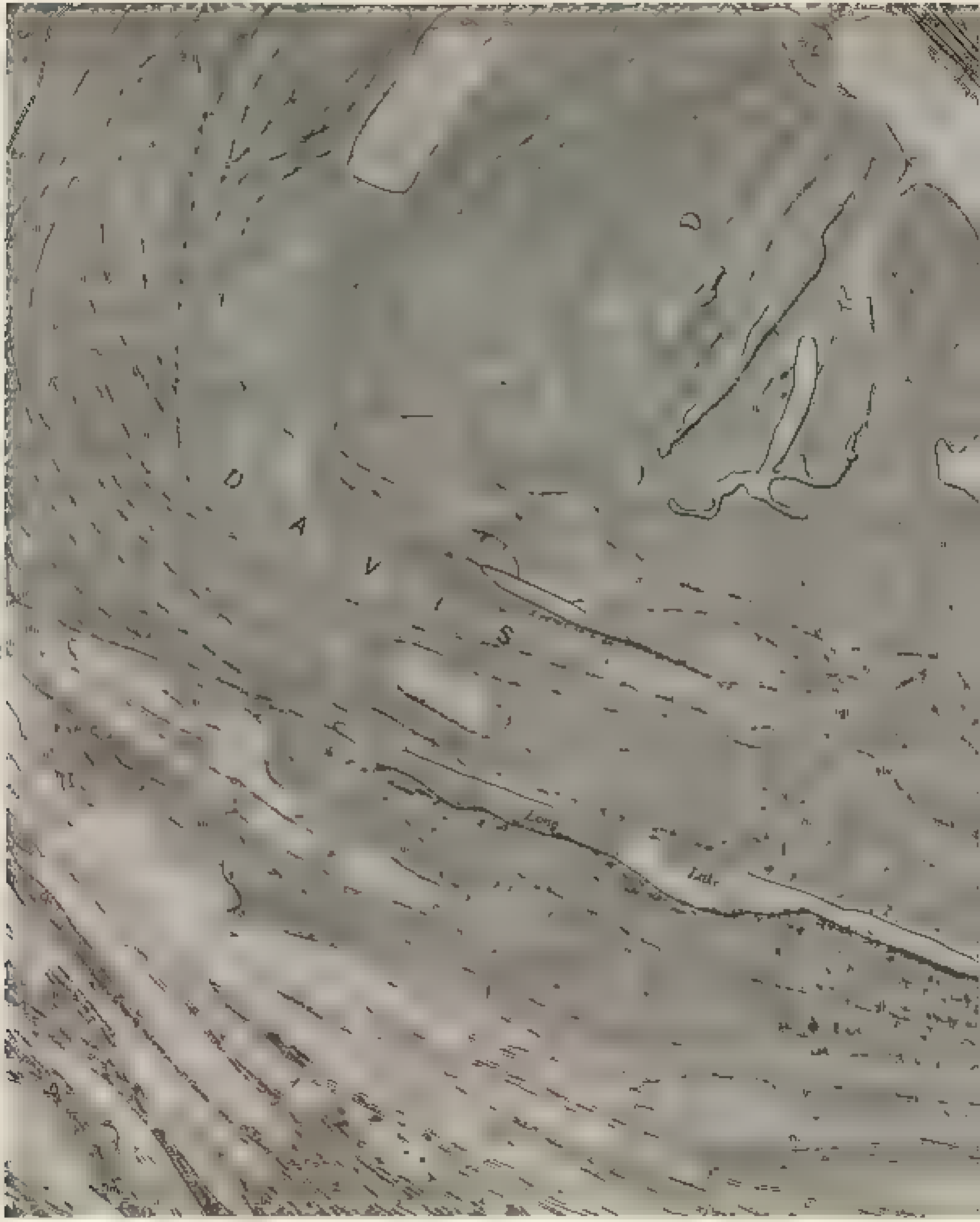


(Joins sheet 78)

Joins sheet 84

(78)

(Joins sheet 71)



Joins sheet 85


PALMYRA ISLAND NO 106
I S L A N D

Joins sheet 72

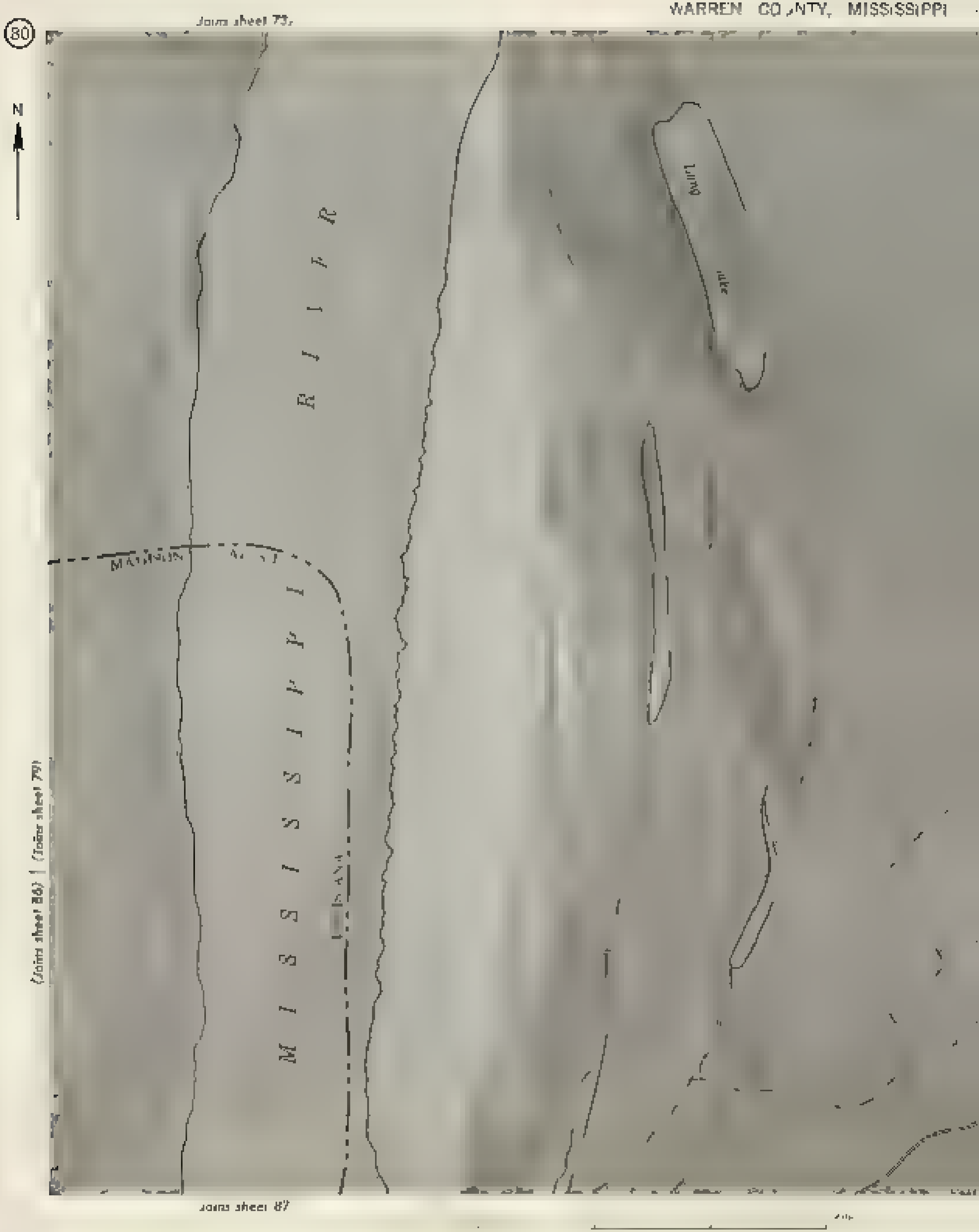
Joins sheet 76

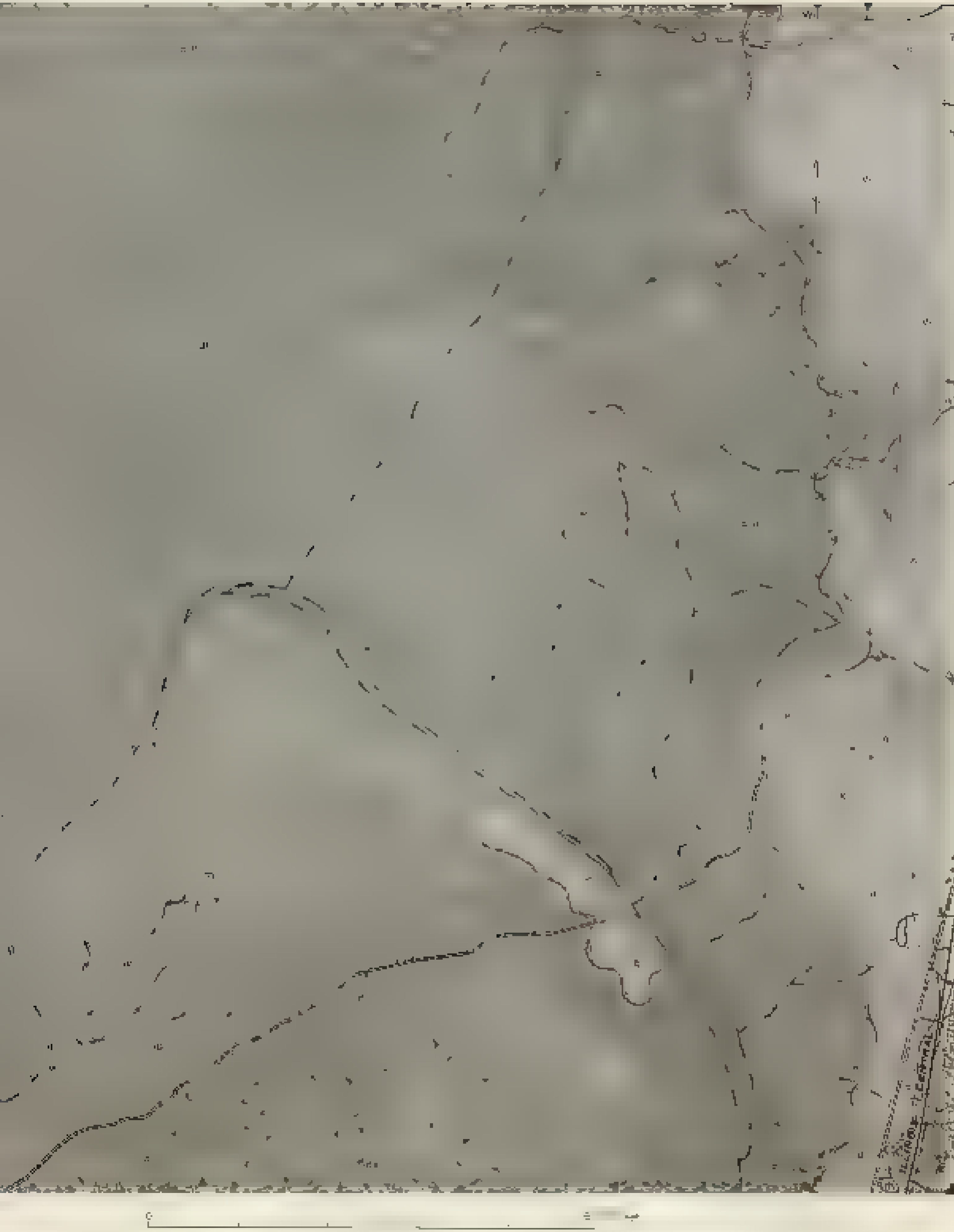
(Joins sheet 86)

79


MADISON
PARISH
RIVER
RED
MADISON
PARISH
Joins sheet 73
Joins sheet 80
N

(80)


Joins sheet 73
N
MISSISSIPPI RIVER
Long Lake
MADISON
Joins sheet 87
(Joins sheet 86) | (Joins sheet 79)



(Joins sheet 81)


Yokena
CENTRAL
Joins sheet 50

SISS PP SHEET NUMBER 81

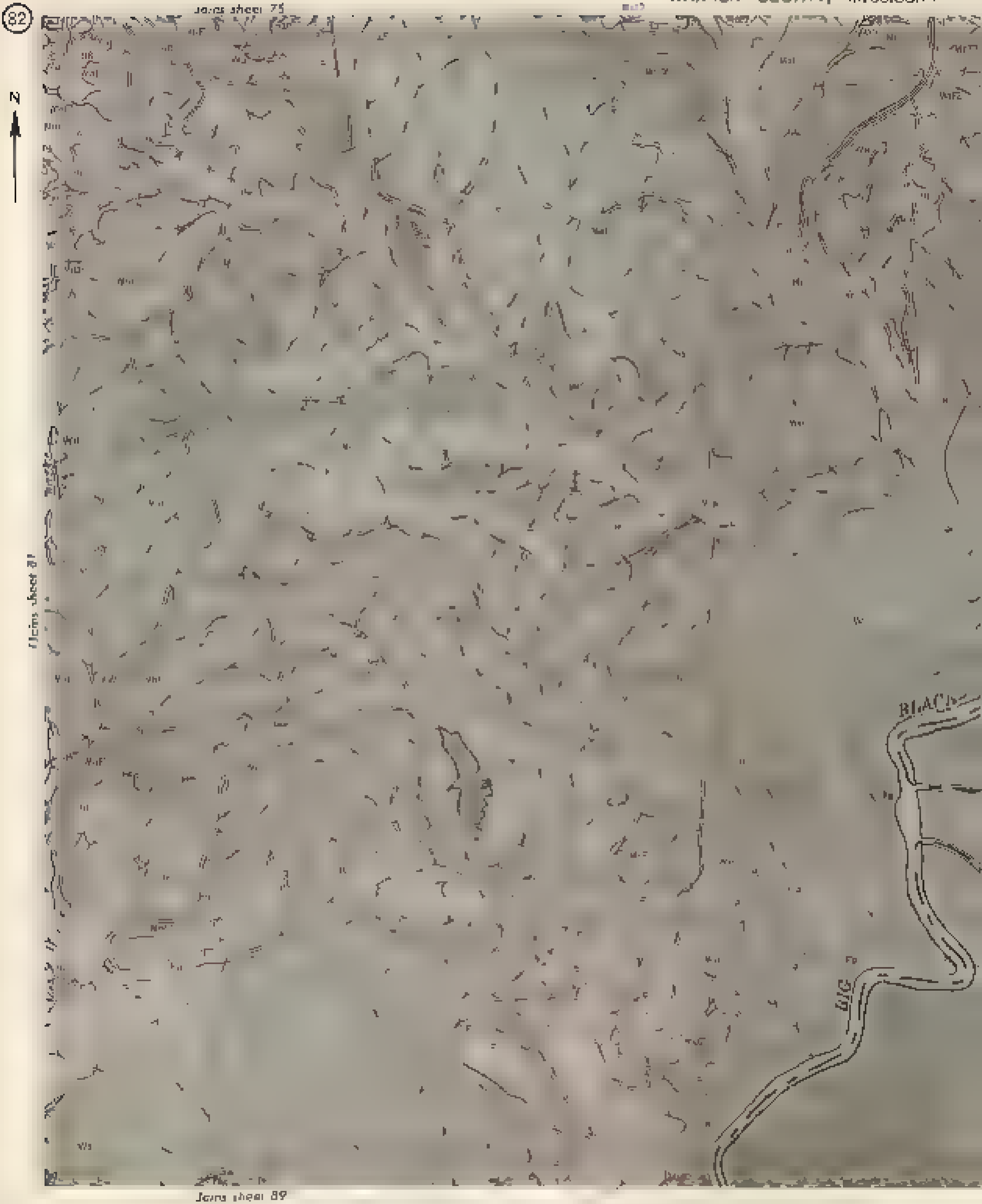
(81)

Join sheet 74

N

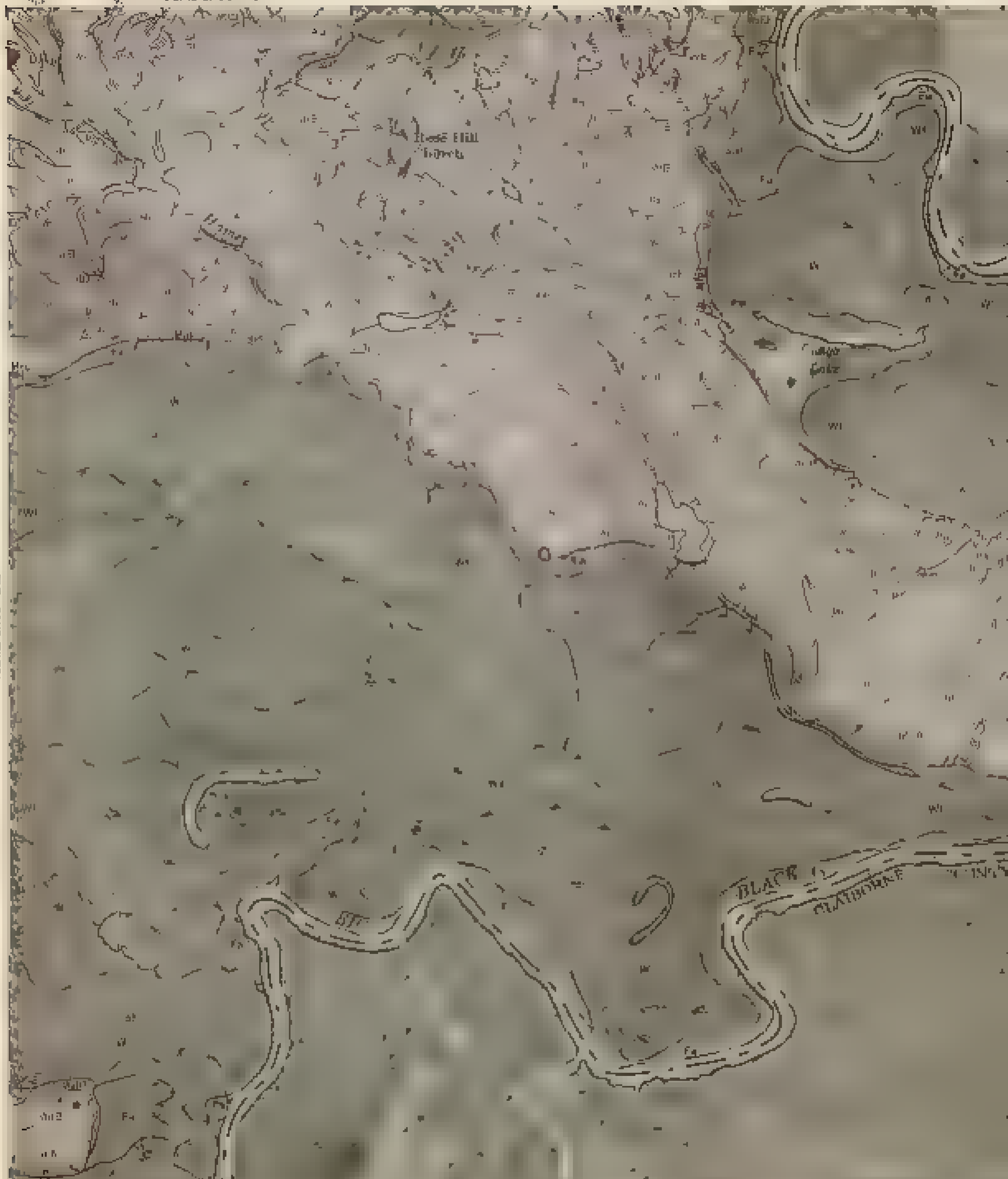
Join sheet 82

Join sheet 88


N
Joins sheet 75
(Joins sheet 81)
BLACK
BIG
Joins sheet 89


BLACK
RIVER
CLAIBORNE
COUNTY
Joins sheet 83

(Joins sheet 76)



(Joins sheet 82)

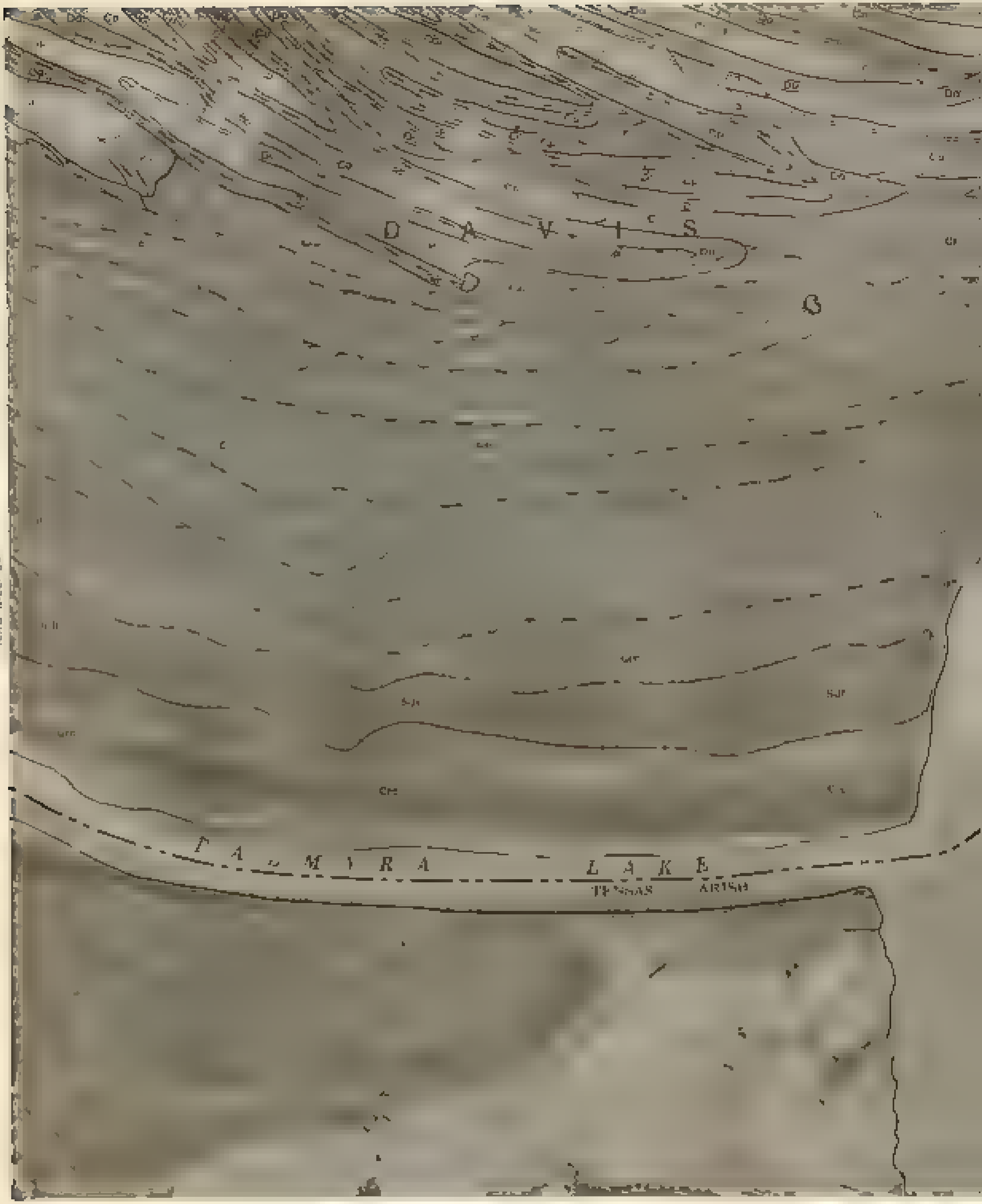
(Joins inset, sheet 89)


83
N
CLAIBORNE
COUNTY
RIVER
COUNTY

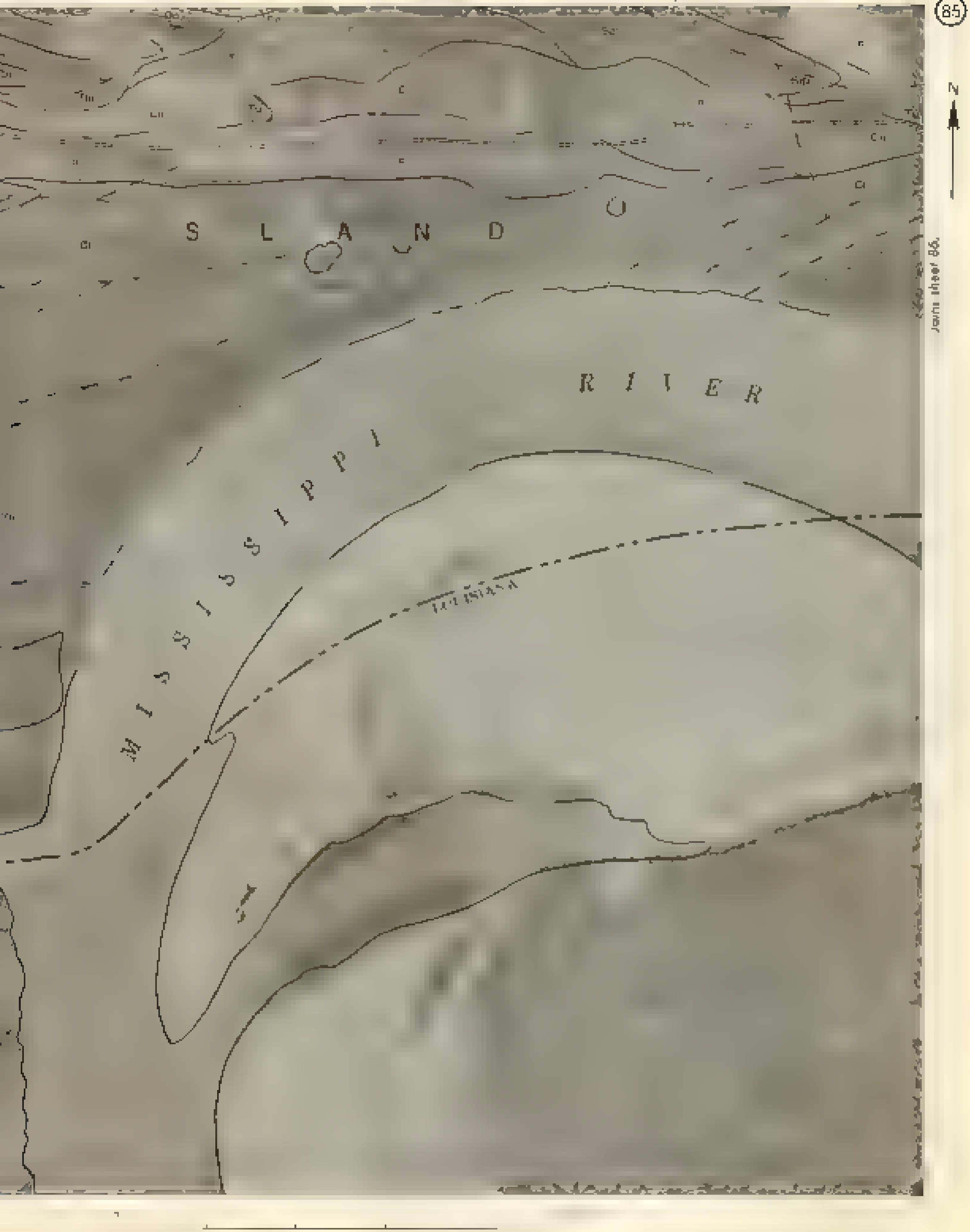
N

Joins sheet 77

Joins sheet 85

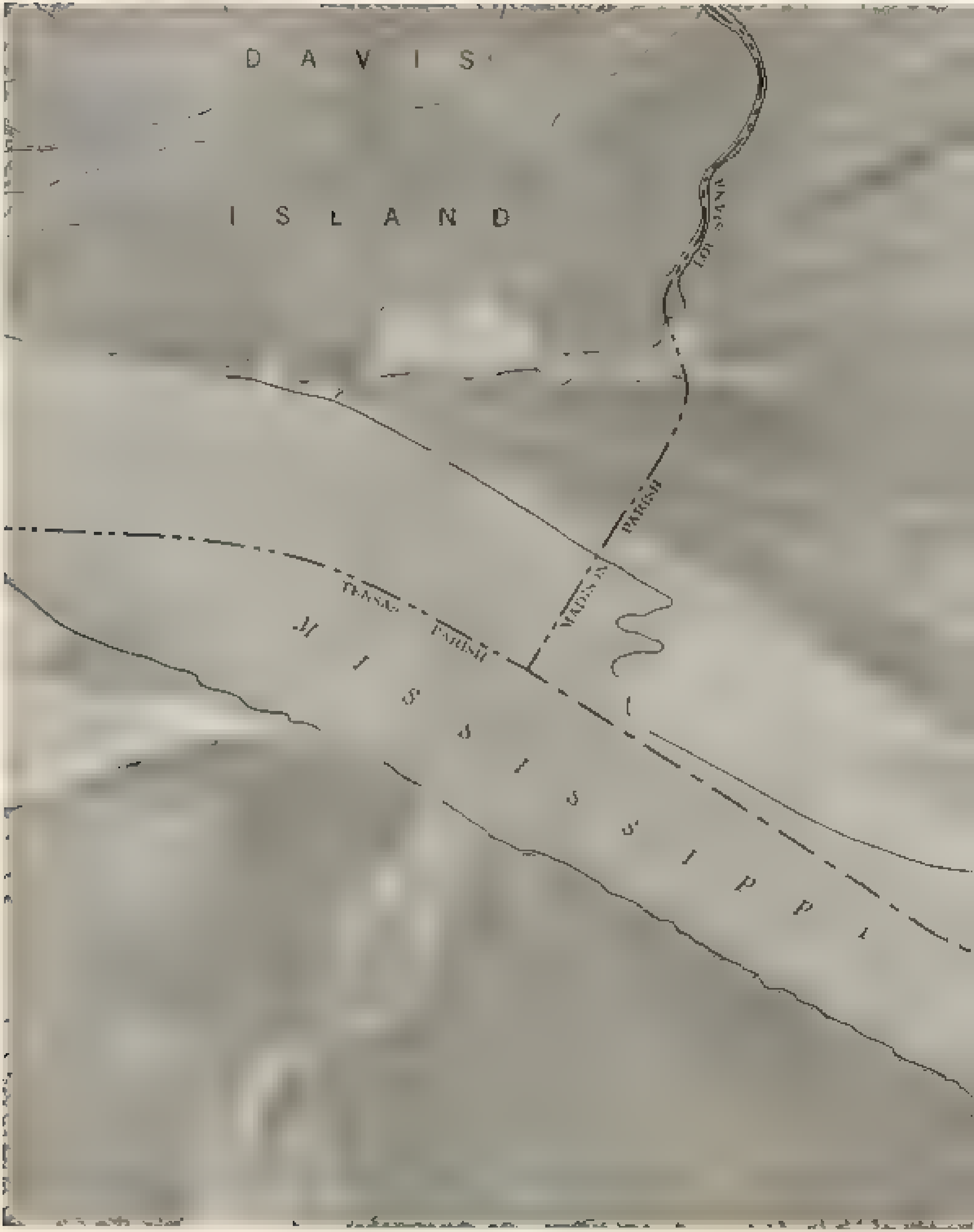

D A V I S
PALMYRA LAKE
TENSAS
ARISO

(Joins sheet 78)



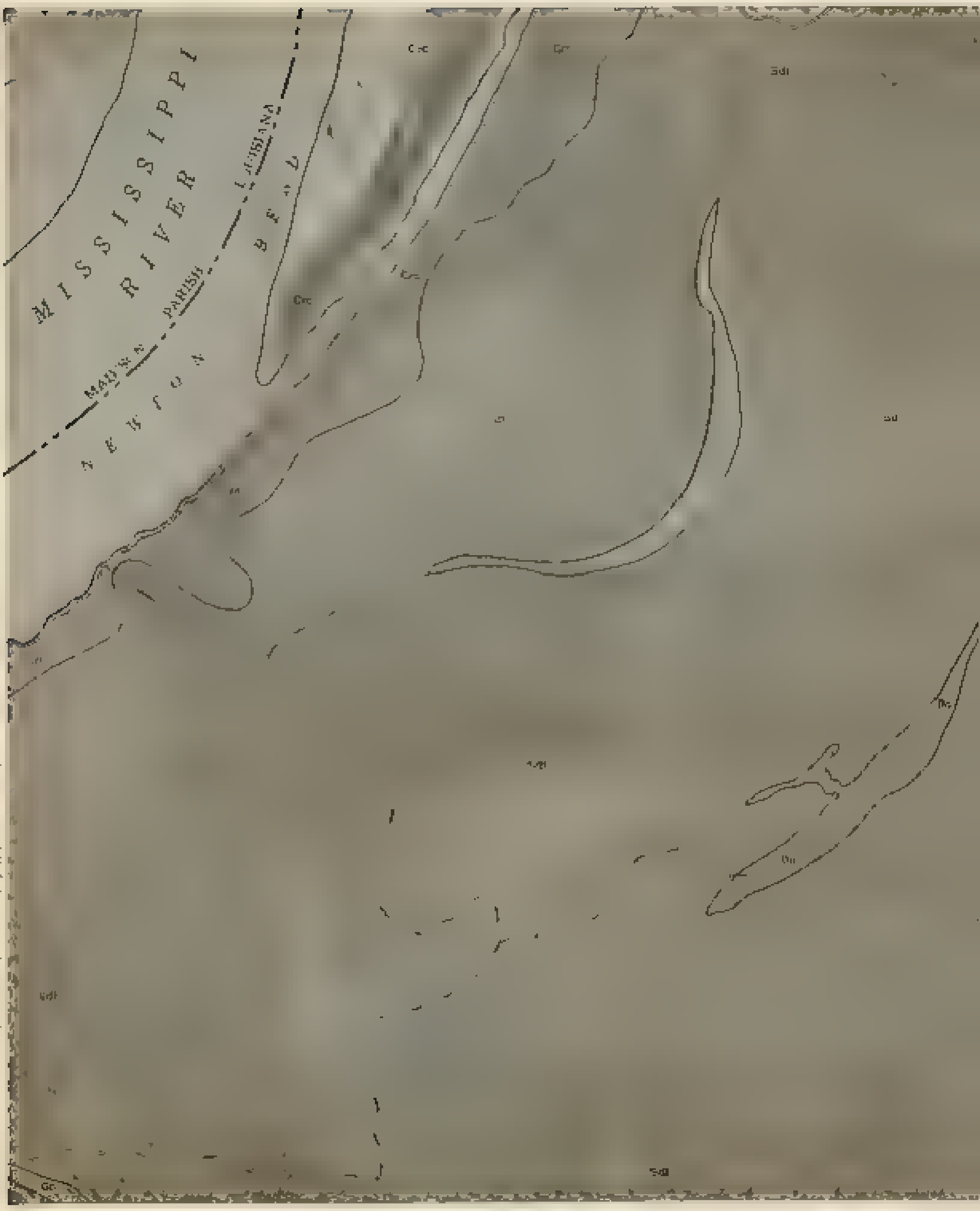
Joins sheet 79

Joins sheet 85



(Joins sheet 87 Join sheet 80)

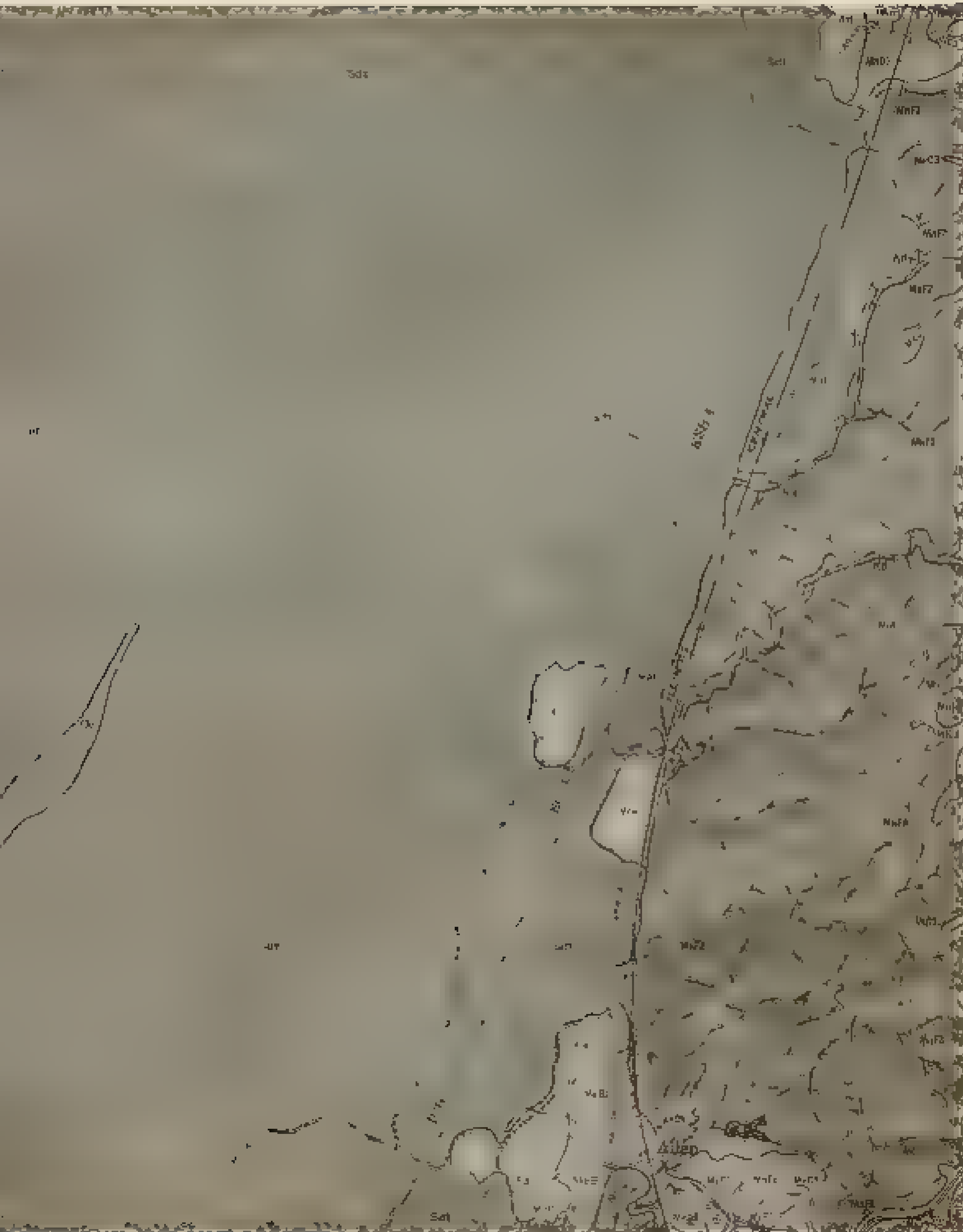
(Joins inset, sheet 90.



(Joins inset, sheet 90) , (Joins sheet 85)

(Joins sheet 80)

N

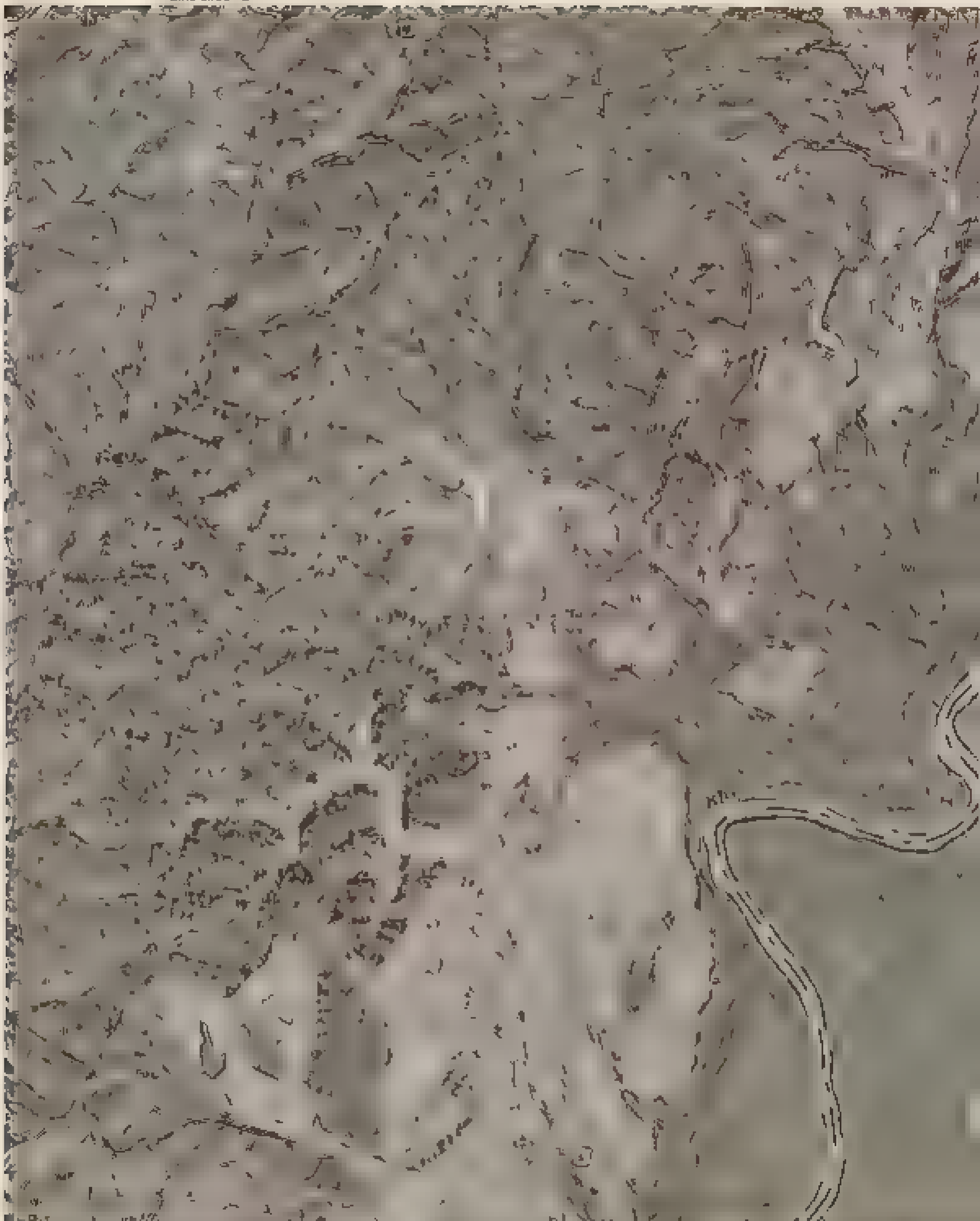


(Joins sheet 88)

(Joins sheet 90)

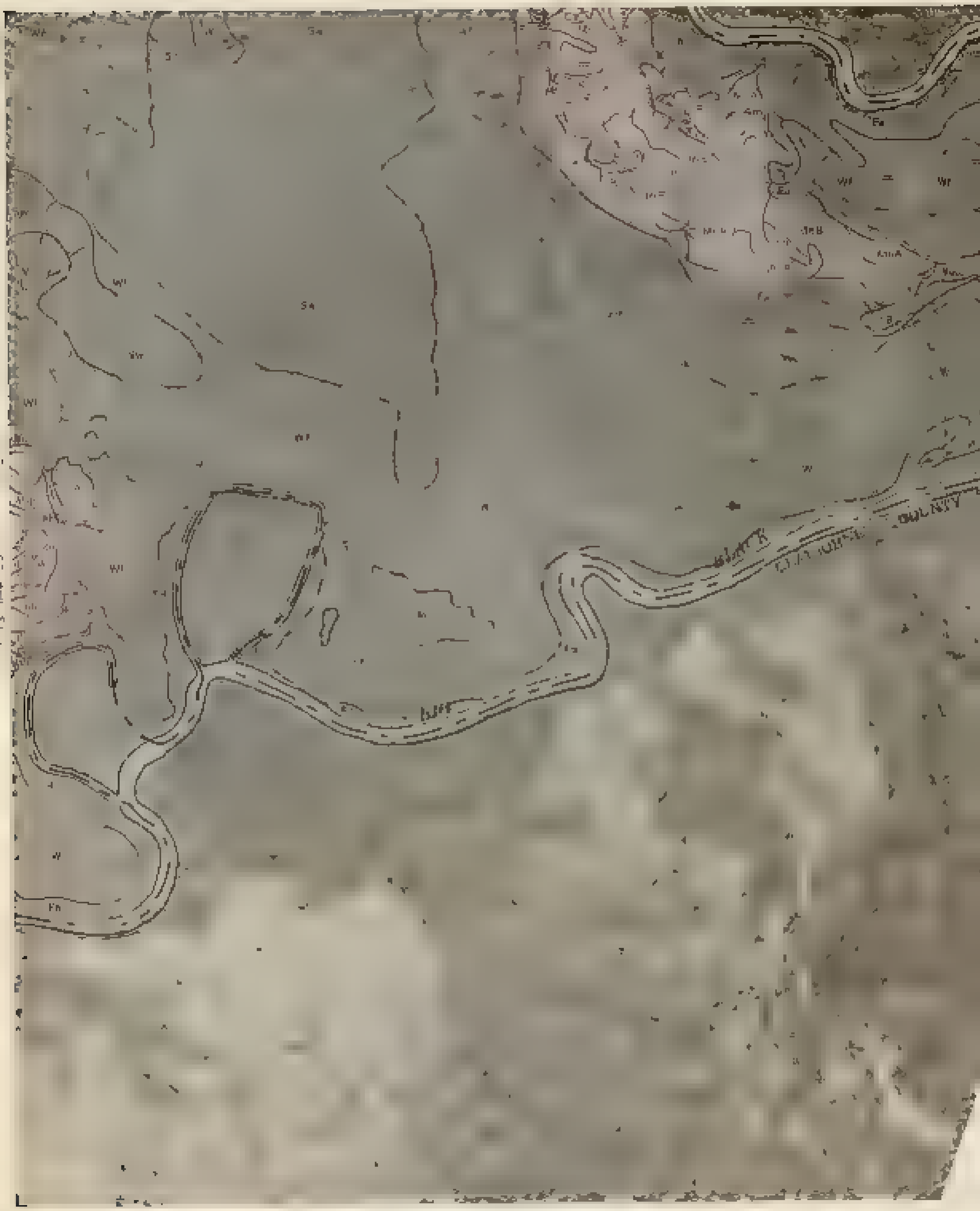
Joins sheet 87

Joins sheet 87



Joins sheet 9

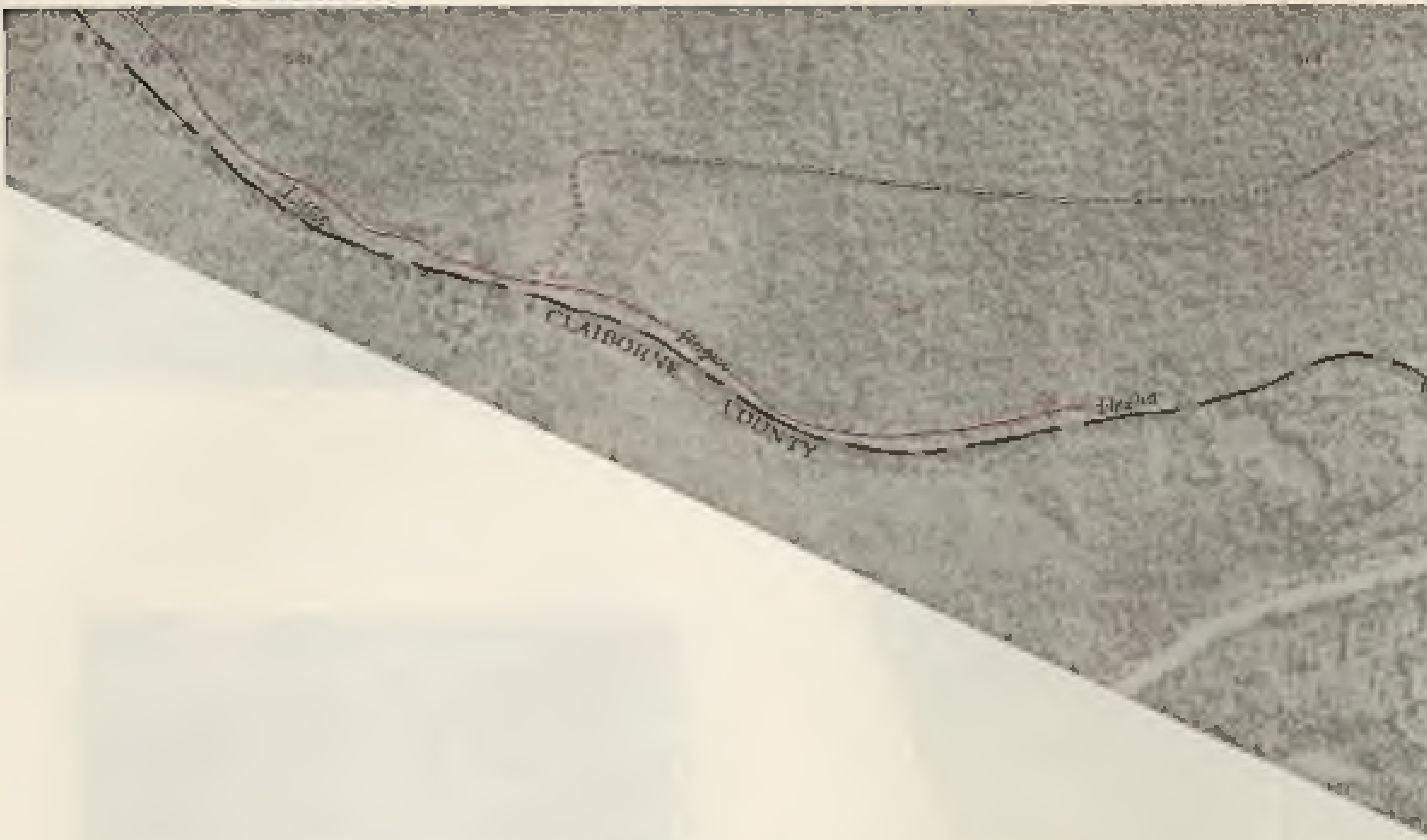
MISSISSIPPI - SHEET NUMBER 88


BLACK
CLAIBORNE COUNTY

(Joins sheet 82)

(Joins sheet 83)

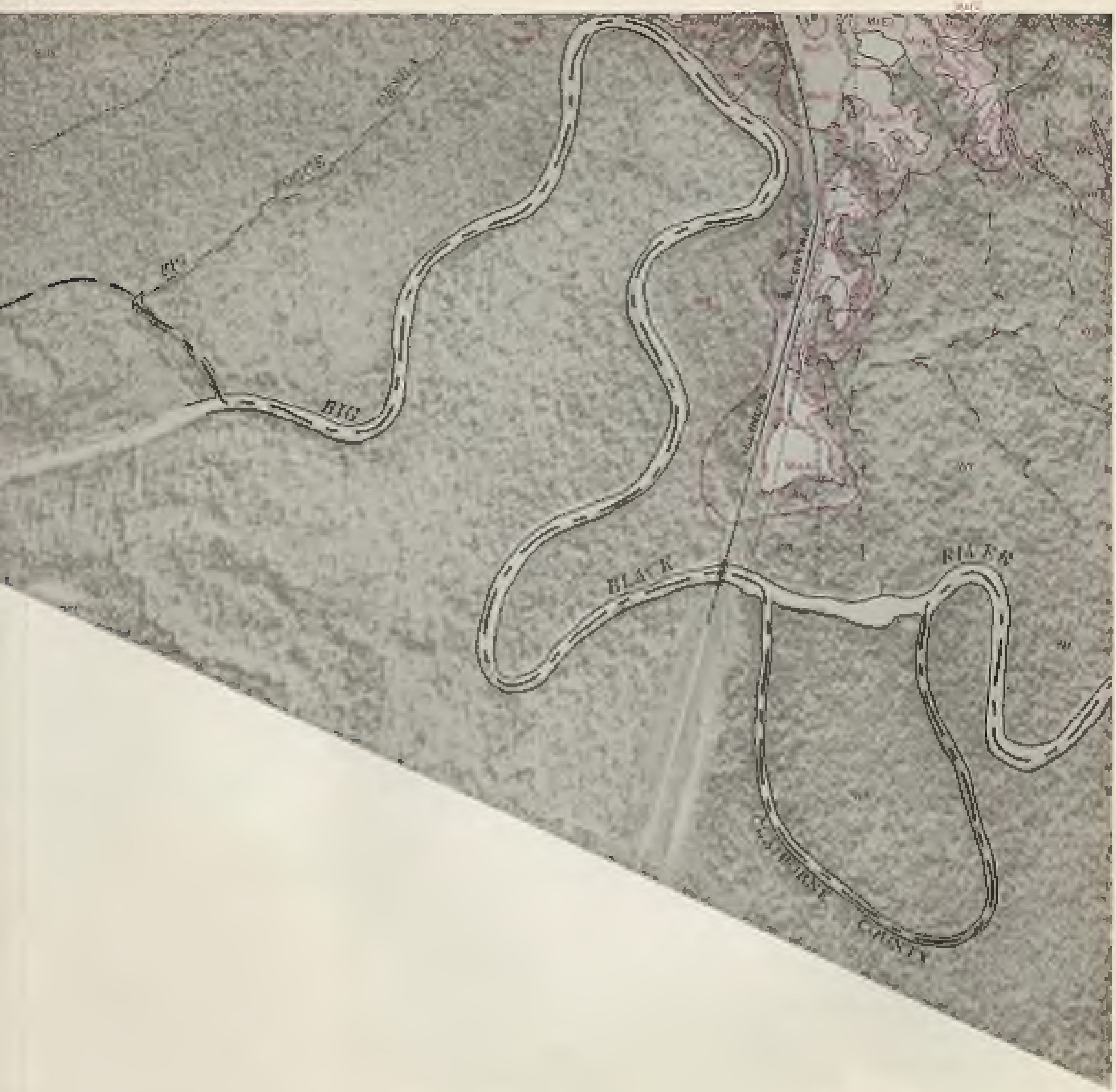
(Joins sheet 87)



(Joins sheet 86)

(Joins sheet 87)

0 ½ 1 Mile



(Joins sheet 91)

0
5000 Feet

(Joins sheet 88)

(Joins sheet 90)

0 ½ 1 Mile

N

0

5000 Feet